



International Space Station Assembly Operations Book

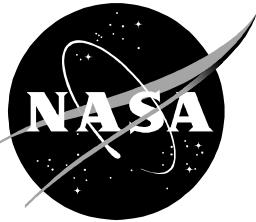
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**INTERNATIONAL SPACE STATION
ASSEMBLY OPERATIONS BOOK
ISS-4A**

PRELIMINARY
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This document is not currently under the configuration control of the Systems Operations Data File Control Board (SODFCB). During the interim, changes may be submitted to the book manager.

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WIRELESS INSTRUMENTATION SYSTEM (SWIS/IWIS)

SWIS SETUP	TBD
SWIS OPERATIONS	TBD
IWIS SETUP	TBD
IWIS OPERATIONS	TBD

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P6 EPS ASSEMBLY, ACT, AND C/O

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P6 EPS ASSY,
ACT, AND C/O

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Z1 DDCU ACTIVATION FROM APCU

1. VERIFY SOURCE POWER TO DDCU Z14B

CRT

SM 200 APCU STATUS

✓APCU 1 OUT VOLTS: 136 --- 144 V

✓APCU 1 OUT CURRENT < 0.7 Amps

2. ENABLE DDCU Z14B REMOTE TERMINAL

PCS

Z1: EPS: DDCU Z14B

DDCU Z14B

sel Firmware

cmd RT - Enable

✓RT Enable - X

cmd Cmd Clear

✓Integ Counter - Incrementing

3. VERIFY DDCU Z14B INPUT AND OUTPUT POWER

✓Vin: 131 --- 149 V

✓Iin < 4 Amps

✓Vout < 5 V

✓Iout < 4 Amps

4. TURN DDCU Z14B CONVERTER ON

sel Converter

cmd Conv On Arm

cmd Conv On

✓Vout: 121 --- 128 V

✓Iout ~4 Amps

✓Converter Temp < 87° C

✓Pwr Supply Temp < 87° C

✓Baseplate Temp < 87° C

* If DDCU output voltage, current, or temperatures go out of range, *

* go to DDCU MALFUNCTION, all (SODF: EPS). *

5. VERIFY RPCM N14B OPERATION

sel RPCM [X] [X] = A B C

sel Firmware
cmd RT - Enable
√RT Enable - X
cmd Cmd Clear
√Integ Counter - Incrementing
√RPCs (1 --- 18) Open
√Input Current < 4 Amps
√Input Voltage: 121 --- 128 V
√Baseplate Temp < 49° C

Repeat

Z1 DDCU DEACTIVATION FROM APCU

1. NOTIFY FLIGHT DIRECTOR OF POWERDOWN

Notify Flight Director of the intent to power off DDCU Z14B.

PCS 2. TURN DDCU Z14B CONVERTER OFF

Z1: EPS: DDCU_Z14B

DDCU_Z14B

sel Converter

cmd Conv Off

✓Vout < 4.2 Vdc

✓Iout < 3.75 Amps

CRT 3. TURN APCU1 CONVERTER OFF AND OPEN OUTPUT RELAY

SM 200 APCU STATUS

SSP1 4. VERIFY DDCU Z14B INPUT

APCU1 CONV → Off

✓APCU1 CONV tb - bp

APCU1 OUTPUT → Off

✓APCU1 OUTPUT tb - bp

✓Vin = 0 Vdc

✓Iin = 0 Amps

✓Integ Counter - Static

P6/Z1 UTILITY CONNECT POWERDOWN

- PCS
1. VERIFY S-BAND XPDR 2 OPERATIONAL POWER OFF
Z1: EPS: RPCM Z13B B
RPCM Z13B B
√RPC 03 Position - Op
 2. VERIFY S-BAND XPDR 2 HEATER POWER OFF
Z1: EPS: RPCM Z14B B
RPCM Z14B B
√RPC 03 Position - Op
 3. VERIFY APCU POWER OFF
√APCU 1,2 CONVERTER tb - bp
√APCU 1,2 OUTPUT tb - bp
 4. **MCC-H** ↑ shuttle, “Go for P6/Z1 Utility Connections.”
IV ⇒ EV, “Go for P6/Z1 Utility Connections.”
 5. EVA perform P6/Z1 UTILITY CONNECTION procedure (40 minute EVA task)
EV ⇒ IV, “P6/Z1 Utility Connections complete.”
Shuttle ↓ **MCC-H**: “P6/Z1 Utility Connections complete. Go for powerup.”
 6. ACTIVATE S-BAND XPDR 2 SURVIVAL HEATER
RPCM Z14B B
sel RPC 03
cmd Close
√Position - Cl

P6 PVCU ACTIVATION

NOTE

The commands for step 1 must be performed before the APCU is powered. When the APCU is powered, the DCSU is powered which automatically provides the PVCU power. If step 1 is after APCU power on, initial BIT will be missed.

PCS 1. CONFIGURE NCS FOR PVCU ACTIVATION

TBD

TBD

cmd TBD Pri_Power_Ena
√TBD Pri Power Ena - <blank>
√TBD Pri Power Init - <blank>

cmd NCS_PVCU_Swover_Inhib_On
√TBD PVCU Swover Inhib Stat - Inh

cmd NCS_to_PVCA_Comm_Path_4B_Pri
√TBD NCS to PVCU Comm Path Stat - 4B

MDM N1-1

√TBD NCS Ancillary Data to PVCA Inhib Stat - Inh

MDM N1-2

√TBD NCS Ancillary Data to PVCA Inhib Stat - Inh

2. ACTIVATE APCUs

Perform APCU ACTIVATION, all (SODF: TBD), then:

3. ENABLE PVCU RTs

Node 1: CDH

MDM N1-2

'Configuration'

cmd Sel_Config_4
√PPL ID - TBD

MDM N1-1

'Configuration'

cmd Sel_Config_4
√PPL ID - TBD

4. CHECK PVCU BIT AND STATUS

TBD

√PVCU_4B_BST_A - 0
√PVCU_4B_BST_B - 0
√PVCU_4B_State - Wait
√PVCU_4B_Frame_Count - Incrementing
Record PVCU_4B Temp: _____

√PVCU_2B_BST_A - 0
√PVCU_2B_BST_B - 0
√PVCU_2B_State - Wait
√PVCU_2B_Frame_Count - Incrementing
Record PVCU_2B Temp: _____

* *****

PCS * If no MDM data *
 * TBD: TBD *
 * TBD *
 * *
 * √PVCU_4B_V ≤ 0 ± 2.8 *
 * √PVCU_2B_V ≤ 0 ± 2.8 *
 * cmd PVCU_4B_On *
 * cmd PVCU_2B_On *
* *****

5. SYNC PVCUs WITH NODE MDMs

TBD

cmd PVCU_4B_Sync_Time
cmd PVCU_2B_Sync_Time
√PVCU_4B_Loss_of_Sync - TBD
√PVCU_2B_Loss_of_Sync - TBD

6. WAIT STATE CONFIGURATION

ODIN gives OK for EPS configuration/commanding.
CDH: TBD

Primary_P6_PVCA_PPL_Version_IDs

√PPL IDs - 1

Backup_P6_PVCA_PPL_Version_IDs

√PPL IDs - 1

EPS: TBD

TBD

√TBD Pri_PV_Reverse_Polarity_Fl (?) - TBD (Deactivated)

√TBD Bkup_PV_Reverse_Polarity_Fl (?) - TBD (Deactivated)

7. READY FOR NOMINAL OPERATION
On ODIN's go, proceed to step 8.
8. COMMAND PVCU TO AN OPERATIONAL STATE
TBD

TBD

cmd TBD PVCU_4B_to_Norm_Op_Assassin_Off
√TBD Pri_PVCU_State - Norm Op

TBD

TBD

cmd PVCU_4B_Sync_Time
√PVCU_4B_Loss_of_Sync - TBD

9. CONFIGURE CHANNEL OPERATIONAL MODES

TBD

cmd Ch_Targeted_Mode_Select
Ch - 4B
Ch_Targeted_Mode - Nonsolar Tracking
BGA_Targeted_Mode - Null
√Ch_4B_Mode - Nonsolar Tracking
√BGA_4B_Mode - Null

NOTE

The nominal Ch mode for 4A is non-solar tracking which prevents the ECU-BGA from turning to the beta angle supplied by GNC.

cmd Ch_Targeted_Mode_Select
Ch - 2B
Ch_Targeted_Mode - Nonsolar Tracking
BGA_Targeted_Mode - Null
√Ch_2B_Mode - Nonsolar Tracking
√BGA_2B_Mode - Null

10. SET ORBITAL PARAMETERS FOR APCU BATTERY CHARGING

NOTE
Obtain values for orbital parameters from **MCC-H.**

TBD

TBD

cmd TBD Pri_PV_Solar_Times
Solar_Rise_Time - _____
Solar_Set_Time - _____
√TBD - TBD

cmd TBD Pri_PV_Orbit_Duration_Time
Orbit_Duration_Time - _____
√TBD - TBD

11. CONFIGURE NCS FOR PVCU SWITCHOVER

TBD
TBD

cmd NCS_ECU_Mode_For_PVCU_Swover
BGA_4B_Target_Mode - Null
Ch_4B_Target_Mode - Nonsolar Tracking
BGA_2B_Target_Mode - Null
Ch_2B_Target_Mode - Nonsolar Tracking
√TBD Ch and BGA modes (?)
cmd NCS_PVCU_Swover_Inhib_Off
√TBD PVCU Swover Inhib Stat - Ena

CH 4B(2B) ACTIVATION

1. DCSU ACTIVATION/CHARGE SOURCE BUS CAPACITANCE
 1. Clear DCSU

NOTE

The Clear command must be sent after DCSU Power On to clear the power on reset bit to identify whether or not the bit gets set again.

PCS

P6: EPS: DCSU 4B(2B)

[DCSU 4B(2B)]

sel Firmware

cmd Clear

2. Verify DCSU Baseplate and Power Supply Temperatures

[DCSU 4B(2B)]

✓Baseplate Temp ≤ 82° C

✓PS Temp ≤ 82° C

3. Power On DCSU Primary Power Bus

NOTE

The RBI 6 Open command must be enabled during activation and after each power on reset to allow the PVCU RBI 6 FDIR algorithm to open the switch if necessary.

sel RBI 6

cmd Open Cmd - Enable

✓Open Cmd - Ena

cmd Close Arm

cmd Close

✓Position - Cl

✓Vbus: 131 --- 149 V

* *****

* If position is Op *

* ✓Command Response *

* ✓Commanded State Failure *

* **cmd** Open *

* ✓Position - Cl *

* **cmd** Close Arm *

* **cmd** Close *

* ✓Position - Cl *

* sel Firmware *

* **cmd** Clear *

* *****

4. Activate DDCU

DCSU 4B(2B)

CAUTION

RBI 5 must be the next switch closed after RBI 6 has been successfully closed to prevent the APCU from tripping.

sel RBI 5
cmd Close Arm
cmd Close
√Position - Cl
√Voltage: 131 --- 149 V
√Current < 4 A

* *****
* If position is Op, perform DCSU MALFUNCTION, *
* all (SODF: EPS), then: *
* *****

DCSU 4B(2B)

sel DDCU 4B(2B)
sel Firmware
cmd Clear
√Integ Counter - Incrementing
√Input Voltage: 131 --- 149 V

* *****
* If Integ Counter is static or voltage is out of range *
* Perform DDCU MALFUNCTION, all (SODF: EPS), then: *
* *****

5. Activate BCDU 4B1(2B1)

DCSU 4B(2B)

sel RBI 2
cmd Close Arm
cmd Close
√Position - Cl
√Voltage: 131 --- 149 V

* *****
* If Integ Counter is static or voltage is out of range *
* Perform DDCU MALFUNCTION, all (SODF: EPS), then: *
* *****

[DCSU 4B(2B)]

sel Energy Storage
sel Firmware
cmd Clear
√Integ Counter - Incrementing
√Pri Vbus: 131 --- 149 V

* *****
* If Integ Counter is static or voltage is out of range *
* Perform BCDU MALFUNCTION, all (SODF: EPS), then: *
* *****

6. Activate BCDU 4B2(2B2)

[DCSU 4B(2B)]

sel RBI 3
cmd Close Arm
cmd Close
√Position - Cl
√Voltage: 131 --- 149 V

* *****
* If position is Op, perform DCSU MALFUNCTION, *
* all (SODF: EPS), then: *
* *****

[DCSU 4B(2B)]

sel Energy Storage
sel Firmware
cmd Clear
√Integ Counter - Incrementing
√Pri Vbus: 131 --- 149 V

* *****
* If Integ Counter is static or voltage is out of range *
* Perform BCDU MALFUNCTION, all (SODF: EPS), then: *
* *****

7. Activate SSU 4B(2B)

[DCSU 4B(2B)]

sel RBI 1
cmd Close Arm
cmd Close
√Position - Cl
√Voltage: 131 --- 149 V

```
*****
* If position is Op, perform DCSU MALFUNCTION, *
* all (SODF: EPS), then: *
*****
```

DCSU 4B(2B)

sel SSU
sel Firmware
cmd Clear
√Integ Counter - Incrementing
√Input Voltage: 131 --- 149 V

```
*****
* If Integ Counter is static or voltage is out of range      *
* Perform SSU MALFUNCTION, all (SODF: EPS), then: *
*****
```

2. DDCU 4B(2B) ACTIVATION

1. Verify DDCU 4B(2B) Input and Output Power

DCSU 4B(2B)

sel DDCU 4B(2B)
√Vin: 131 --- 149 V
√lin < 4 Amps
√Vout < 5 V
√Iout < 4 Amps

2. Turn DDCU 4B(2B) Converter On

sel Converter
cmd Conv On - Arm
cmd Conv On
√Vout: 121 --- 128 V
√Iout < 4 Amps
√Converter Temp < 87° C
√Pwr Temp < 87° C
√Baseplate Temp < 87° C

```
*****
* If DDCU output voltage, current, or temperatures go out of range *
* Perform DDCU MALFUNCTION, all (SODF: EPS), then: *
*****
```

3. Verify RPCM A Operation

DDCU 4B(2B)

sel RPCM A
sel Firmware
cmd Clear
√Integ Counter - Incrementing
√RPCs (1 --- 8) Open
√Input Voltage: 121 --- 128 V
√Input Current < 4 Amps
√Baseplate Temp < 49° C

4. Verify RPCM B Operation

DDCU 4B(2B)

sel RPCM B
sel Firmware
cmd Clear
√Integ Counter - Incrementing
√RPC 1 Open
√Input Voltage: 121 --- 128 V
√Input Current < 4 Amps
√Baseplate Temp < 49° C

3. CHANNEL 4B(2B) PVTCS ACTIVATION

1. Configure PVTCS 4B(2B) Algorithms for Initial Activation

P6: EPS: PVTCS 4B(2B)

PVTCS 4B(2B)

'PFCS'

sel Pumps
cmd Pump Auto Switchover - Inhibit Arm
cmd Pump Auto Switchover - Inhibit

PVTCS 4B(2B)

'PFCS'

sel FCV
cmd FCV Control - Inhibit Arm
cmd FCV Control - Inhibit

PVTCS 4B(2B)

'PFCS'

sel Software Inhibits
cmd Min Inlet Temp Shutdown - Inhibit Arm
cmd Min Inlet Temp Shutdown - Inhibit

2. Assess Battery Temp

PVTCS 4B(2B)

'Batteries'

- ✓ Batt 4B11(2B11) Avg Temp < 7.2° C
- ✓ Batt 4B12(2B12) Avg Temp < 7.2° C
- ✓ Batt 4B21(2B21) Avg Temp < 7.2° C
- ✓ Batt 4B22(2B22) Avg Temp < 7.2° C

- * If any Batt Avg Temp \geq 7.2° C *
- * 'PFCS' *
- *
- *
- * sel FCV *
- * cmd FCV Recovery - Inhibit Arm *
- * cmd FCV Recovery - Inhibit *

NOTE

Upon application of power to the PFCS, the FCV executes power on recalibration which will last approximately 93 seconds. The caution message expected upon successful completion of this recalibration is 'PFCS 4B(2B) FCV Recal Complete'.

PVTCS 4B(2B)

sel RPCM 4B(2B) A RPC 03
cmd Close
✓Position - CI

4. Issue Common Clear to PFCS

PVTCS 4B(2B)

sel Firmware
cmd Common Clear

5. Verify FCV 4B(2B) Recalibration

PVTCS 4B(2B)

✓FCV Position = 0 ± 5.3 Degrees (Full bypass)

```
*****
* If warning message 'PFCS 4B(2B) FCV Failure-High Temp' received *
*   P6: EPS: PVTCS 4B(2B) *
*     [PVTCS 4B(2B)] *
*     'PFCS' *
*   sel   FCV *
*   cmd  FCV - Recal Arm *
*   cmd  FCV Recal *
*   *
*   If warning message occurs again *
*     Perform FCV MANUAL RECALIBRATION, all (SODF: EPS), *
*     then: *
*       ✓MCC-H. *
*****
```

6. Verify PFCS 4B(2B) Parameters Prior to Pump Activation

[PVTCS 4B(2B)]

'PFCS Data'

✓Inlet Press: 690 --- 2000 kPa
 ✓Outlet Press: 690 --- 2000 kPa
 ✓Byp In temp: -5 --- 10° C
 ✓Outlet Temp 1,2 > -42.7° C
 ✓Outlet Temp 1,2: -5 --- 10° C
 ✓Accum Avg Qty: 30.9 --- 74.1%

```
*****
* If PVTCS temperatures out of range *
*   Perform PVTCS TEMP OUT OF RANGE, all *
*   (SODF: EPS), then: *
*   *
* If PVTCS pressures out of range *
*   Perform PVTCS PRESSURE OUT OF RANGE, *
*   all (SODF: EPS), then: *
*****
```

7. Activate PFCS 4B(2B) Pump

WARNING

Both pumps are not allowed to operate simultaneously.

NOTE

The PFCS pump will spin up within 10 seconds.

[PVTCS 4B(2B)]

'PFCS'

```

sel Pumps
cmd Pump A - On
√Pump A Conv Speed > 11025 --- 12975 rpm
*****
* If caution message 'PFCS 4B(2B) Pump A Failure' received      *
* and Pump A Speed < 12000 rpm                                *
* 'PFCS'                                                       *
*                                                               *
* sel Pumps                                                 *
* cmd Pump A - Off                                         *
* cmd Pump B - On                                         *
* √Pump A Conv Speed > 12000 rpm                           *
*                                                               *
* If caution message occurs for Pump B(A)                      *
* Perform PFCS PUMP FAILURE, all (SODF: EPS), then:          *
* √MCC-H                                                       *
*****

```

8. Verify PVTCS 4B(2B) Parameters Post Activation

PVTCS 4B(2B)

'PFCS Data'

√Inlet Press: 1241 --- 1448 kPa
 √Outlet Press: 1379 --- 1482 kPa
 √Flow Rate: 765 --- 1176 Kg/hr
 √Pump A Conv Spd > 12000 rpm
 √Byp In temp: -5 --- 10° C
 √InletTemp > -42.7° C
 √Outlet Temp 1,2: -5 --- 10° C
 √Accum Avg Qty: 30.9 --- 74.1%

```

*****
* If PVTCS temperatures out of range                         *
* Perform PVTCS TEMP OUT OF RANGE, all                      *
* (SODF: EPS), then:                                         *
*                                                               *
* If PVTCS pressures out of range                            *
* Perform PVTCS PRESSURE OUT OF RANGE,                      *
* all (SODF: EPS), then:                                     *
*****

```

9. Apply RPC Open Command - Inhibit

PVTCS 4B(2B)

```

sel RPCM 4B(2B) A RPC 03
cmd Open Cmd - Inh
√Open cmd - Inh

```

10. Enable PVTCS Closed Loop Control Algorithms

PVTCS 4B(2B)

'PFCS'

NOTE

Enabling the FCV Control algorithm will initiate the PVTCS close loop control, which may cause the present FCV position to change.

sel FCV

cmd FCV Control - Enable Arm

cmd FCV Control - Enable

PVTCS 4B(2B)

sel Pumps

cmd Pump Auto Switchover - Enable Arm

cmd Pump Auto Switchover - Enable

11. Configure PFCS Outlet Temp Algorithm for Nominal Operations

NOTE

The following steps may require additional time for thermal stabilization.

If PFCS Outlet Temp 1,2 < 10° C

PVTCS 4B(2B)

sel Software Inhibits

cmd Max Outlet Temp Shutdown - Enable Arm

cmd Max Outlet Temp Shutdown - Enable

12. Configure PFCS Inlet Temp Algorithm for Nominal Operations

NOTE

The following steps may require additional time for thermal stabilization.

If PFCS Inlet Temp > -47.2° C

PVTCS 4B(2B)

sel Software Inhibits

cmd Min Inlet Temp Shutdown - Enable Arm

cmd Min Inlet Temp Shutdown - Enable

13. Configure FCV Recovery Algorithm for Nominal Operations

If FCV Recovery Inhibited (in step 3) and all batteries Avg Temp < 7.2° C

PVTCS 4B(2B)

sel FCV

cmd FCV Recovery - Enable Arm

cmd FCV Recovery - Enable

CH 4B(2B) BCDU/BATTERY CHECKOUT

NOTE

Execute this procedure one BDCU/Battery string at a time.
One string will be completely activated prior to starting the next
BCDU/Battery string.

- PCS
1. CHECK IF BCDU 4B1(2B1) IS COMMUNICATING WITH PVCU
P6: EPS: ENERGY STORAGE 4B(2B)
ENERGY STORAGE 4B(2B)
'BCDU 4B1(2B1)'

√Integ Counter - Incrementing
 2. VERIFY BCDU 4B1(2B1) BASEPLATE TEMPERATURE IS WITHIN SURVIVAL RANGE
√Baseplate Temp: -42.8 --- 82.2° C
 3. VERIFY BCDU 4B1(2B1) VOLTAGE AND CURRENT SENSORS
√Primary Voltage: 130.0 --- 150.0 V
√Primary Current < 3.0 A
√FI Input Voltage < 4.0 V
√FI Input Current < 2.0 A
√Battery Voltage < 1.0 V
√Battery Current < 2.0 A
√CP RBI Voltage < 3.0 V
√CP RBI Current < 1.0 A
 4. VERIFY BATTERY 4B11(2B11) SWITCH CONFIGURATION, ORU AND CELL VOLTAGES
'Battery 4B11(2B11)'

√Vbus < 4.0 V
√Drain - Open
√Htr 1,2 - Open

sel Cells

√02, 08, 20, 28 Volt < 0.02 V
 5. VERIFY BATTERY 4B12(2B12) SWITCH CONFIGURATION, ORU AND CELL VOLTAGES
'Battery 4B12(2B12)'

√Vbus < 4.0 V
√Drain - Open
√Htr 1,2 - Open

sel Cells

✓02, 08, 20, 28 Volt < 0.02 V

6. CHECK IF BCDU 4B2(2B2) IS COMMUNICATING WITH PVCU 'BCDU 4B2(2B2)'

✓Integ Counter - Incrementing

7. VERIFY BCDU 4B2(2B2) BASEPLATE TEMPERATURE IS WITHIN SURVIVAL RANGE

✓Baseplate Temp: -42.8 --- 82.2° C

8. VERIFY BCDU 4B2(2B2) VOLTAGE AND CURRENT SENSORS

✓Primary Voltage: 130.0 --- 150.0 V

✓Primary Current < 3.0 A

✓FI Input Voltage < 4.0 V

✓FI Input Current < 2.0 A

✓Battery Voltage < 1.0 V

✓Battery Current < 2.0 A

✓CP RBI Voltage < 3.0 V

✓CP RBI Current < 1.0 A

9. VERIFY BATTERY 4B21(2B21) SWITCH CONFIGURATION, ORU AND CELL VOLTAGES

'Battery 4B21(2B21)'

✓Vbus < 4.0 V

✓Drain - Open

✓Htr 1,2 - Open

sel Cells

✓02, 08, 20, 28 Volt < 0.02 V

10. VERIFY BATTERY 4B22(2B22) SWITCH CONFIGURATION, ORU AND CELL VOLTAGES

'Battery 4B22(2B22)'

✓Vbus < 4.0 V

✓Drain - Open

✓Htr 1,2 - Open

sel Cells

✓02, 08, 20, 28 Volt < 0.02 V

11. DATA DUMP

NOTE

This is an **MCC** step only. If time permits,
dump the cell voltages for each battery ORU.

Perform PVCA DATA DUMP procedure to dump cells 1 --- 38 for each
battery ORU.

Print a hardcopy of the display containing the dump data.

✓Cell 01 through 38 Volt < 0.02 V

SSU ACTIVATION

- PCS
1. VERIFY DCSU 4B(2B) RBI 1 VOLTAGE AND CURRENT
P6: EPS: SSU 4B(2B)

SSU 4B(2B)
'DCSU 4B(2B)'

✓RBI 1 RBI I < 8 A
✓RBI 1 RBI V: 132 --- 148 V

2. VERIFY COMMUNICATION WITH SSU 4B(2B)
✓Integ Counter - Incrementing
3. VERIFY SSU 4B(2B) LFDP STATUS
✓LFDP1 - Off
✓LFDP2 - Off
✓LFDP3 - Off

NOTE

The SSU 4B(2B) LFDP defaults to the off-state upon SSU activation.

4. VERIFY SSU 4B(2B) SENSOR AND SETPOINT OPERATION
✓PCVE1 Bus Voltage: 11 --- 29 V
✓PCVE2 Bus Voltage: 11 --- 29 V
✓PCVE3 Bus Voltage: 11 --- 29 V
✓Shunt Circuit1 Current < 3 A
✓Shunt Circuit2 Current < 3 A
✓Right Sidewall Temp: -55 --- 121° C
✓Left Sidewall Temp: -55 --- 121° C
✓Output Voltage: 132 --- 148 V
✓Output Current < 5 A
✓Bus Voltage Setpoint: 150 --- 167 V
✓Error Bus Voltage: 11 --- 29 V
✓Power Supply Output Status - Nominal
✓Pwr On Reset - Reset
✓DC Cntrl Pwr Input Status - Off

sel 'PVCE'

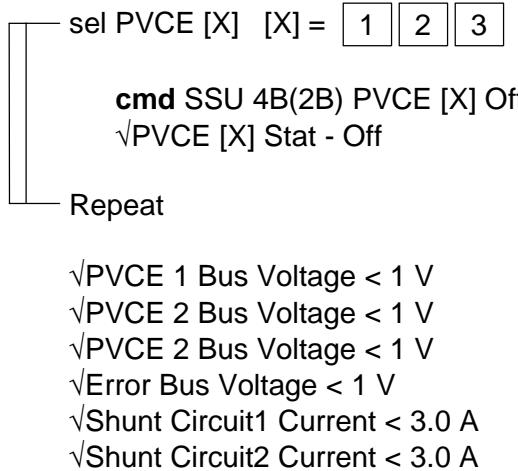
✓PVCE1 Bus Voltage Setpt Cmd Stat = TBD V
✓PVCE2 Bus Voltage Setpt Cmd Stat = TBD V
✓PVCE3 Bus Voltage Setpt Cmd Stat = TBD V

5. CONFIGURE SSU 4B(2B) TO FULL SHUNT MODE

NOTE

All three PVCEs must be commanded Off to configure the SSU to full shunt mode. The SSU firmware will automatically clamp the SSU output once two of the three PVCEs are off. This step must be completed prior to deploying the Solar Array to avoid transients on the DCSU primary power bus.

sel 'PVCE'



CH 4B(2B) ECU/BGA/SAW ACTIVATION

1. PROVIDE POWER INPUTS TO ECU
PCS P6: EPS: BGA 4B(2B)
 BGA 4B(2B)

'RPCM 4B(2B) A'

sel RPC 01
cmd Close
√Position - CI
2. PROVIDE REDUNDANT POWER INPUTS TO ECU
'RPCM 2B(4B) A'

sel RPC 02
cmd Close
√Position - CI
3. SAW COMMAND CLEAR
'ECU 4B(2B)'

sel SAW FIRMWARE
cmd Clear
4. BGA COMMAND CLEAR
sel BGA FIRMWARE
cmd Clear
5. VERIFY ECU PWR SUPPLY TEMPS, VOLTAGE, AND INTEG COUNTER STATUS
√SAW PS Voltage: 110 --- 129 Vdc
√SAW PS Temp: -42 --- 71° C
√SAW Integ Counter - Incrementing

√BGA PS Voltage: 110 --- 129 Vdc
√BGA PS Temp: -42 --- 71° C
√BGA Integ Counter - Incrementing
6. VERIFY SAW MDA TEMPERATURES ARE WITHIN NOMINAL RANGES
P6: EPS: SAW 4B(2B) Deploy/Retract
 SAW 4B(2B) Deploy/Retract

'LBB'

√MDA Temp, deg C: -42 --- 71° C

'RBB'

√MDA Temp, deg C: -42 --- 71° C

'Mast'

√MDA Temp, deg C: -42 --- 71° C

```
*****
* If any value out of expected range      *
* Determine new Beta Gimbal angle to   *
* support out-of-temp range correction  *
* prior to SAW Deploy.                  *
*****
```

7. VERIFY BLIND MODE SET TO NULL

P6: EPS: BGA 4B(2B)

BGA 4B(2B)

'BGA 4B (2B)'

sel Mode

√Selected Blind Mode = Null

8. POSITION AND LOCK BETA GIMBAL

NOTE

The BGA controller will automatically control the Drive Motor and the Anti-Rotation Latch at Targeted Mode. Upon completion of the Targeted Mode executed, wait approximate 10 minutes to verify the parameters. Upon completion of the Beta Gimbal anti-rotation latch operation, the ECU will automatically command the BGA motor drive off.

P6: EPS: ECU/BGA 4B(2B)

ECU/BGA 4B(2B)

'BGA 4B (2B)'

sel Mode

Mode Safe/Lock

set Commanded Angle, deg = 90 (270)

set Latch Select = Latch 1

cmd Safe Lock

PARAMETER	INITIAL→	TRANSITION→	LATCHED
√Motor Velocity, deg/min	0	± 4.05	0
√Motor Current, Amps	0	± 0.025 ± 5% TBD	0
√Cal PID Current, Amps	0	± 0.025 ± 5% TBD	0
√Resolver Position, deg	0	0 --- 90(270)	90(270)
√Latch Current, Amps	0	-0.6 --- 3.6	0
√Latch 1 Position	Latched	Unlatched	Latched
√Latch 1 Voltage	0	15	0
√Latch 2 Position	Unlatched	Unlatched	Unlatched
√Latch 2 Voltage	0	15	0

CH 4B(2B) BATTERY THERMAL CONDITIONING

1. If shuttle crew required to execute this procedure using the PCS from the AFD:

MCC-H ⇒ shuttle: "Go for Channel 4B(2B) Thermal Conditioning."
2. CONFIGURE BCDU 4B(2B) FUNCTIONAL INHIBITS TO ENABLE BATTERY HEATER CONTROL
 1. Enable Battery Heater Control

P6: EPS: ENERGY STORAGE 4B(2B)
'Battery 4B11(2B11)'

sel BSCCM

cmd Battery Heater Control Ena Arm
cmd Battery Heater Control Ena
√Battery Heater Control - Ena

'Battery 4B12(2B12)'

sel BSCCM

cmd Battery Heater Control Ena Arm
cmd Battery Heater Control Ena
√Battery Heater Control - Ena

'Battery 4B21(2B21)'

sel BSCCM

cmd Battery Heater Control Ena Arm
cmd Battery Heater Control Ena
√Battery Heater Control - Ena

'Battery 4B22(2B22)'

sel BSCCM

cmd Battery Heater Control Ena Arm
cmd Battery Heater Control Ena
√Battery Heater Control - Ena
 2. Enable BCDU Heater Power Control

P6: EPS: TBD
TBD

cmd BCDU 4B(2B)1 Heater Power Control Ena Arm
cmd BCDU 4B(2B)1 Heater Power Control Ena
√BCDU 4B(2B)1 Heater Power Control - Ena

cmd BCDU 4B(2B)2 Heater Power Control Ena Arm
cmd BCDU 4B(2B)2 Heater Power Control Ena
√BCDU 4B(2B)2 Heater Power Control - Ena

3. CONFIGURE SSU 4B(2B) PVCEs FOR POWER OUTPUT AND ENABLE LFDP
P6: EPS: SSU 4B(2B)

sel PVCE

1. Command SSU 4B(2B) PVCEs On

cmd PVCE 1 On Arm

cmd PVCE 1 On

✓PVCE 1 Stat - On

cmd PVCE 2 On Arm

cmd PVCE 2 On

✓PVCE 2 Stat - On

cmd PVCE 3 On Arm

cmd PVCE 3 On

✓PVCE 3 Stat - On

✓Vehicle is in insolation

* If vehicle is not in insolation, wait until vehicle is in insolation. *

NOTE

Solar Arrays must be in sunlight in order for the SSU to control bus voltage. If the vehicle is in eclipse, pause before using the SSU output voltage check to verify proper SSU operation.

P6: EPS: SSU 4B(2B)

✓Output Voltage: 165 --- 169 V

2. Enable SSU 4B(2B) Load Fault Detection Protection
sel LFDP

cmd LFDP 1 On Arm

cmd LFDP 1 On

✓LFDP 1 Stat - On

cmd LFDP 2 On Arm

cmd LFDP 2 On

✓LFDP 2 Stat - On

cmd LFDP 3 On Arm

cmd LFDP 3 On

✓LFDP 3 Stat - On

4. MONITOR BATTERY TEMPERATURES AND PRESSURES DURING BATTERY CONDITIONING AND CLOSE BCDU 4B(2B) CONTROL POWER RBIS

P6: EPS: Energy Storage 4B(2B)

sel Battery 4B(2B)11 Cells

sel Battery 4B(2B)12 Cells

sel Battery 4B(2B)21 Cells

sel Battery 4B(2B)22 Cells

NOTE

1. For step 4.1, the crewmember or ground controller performing this procedure must watch that the heater switches in the BCDU are closed during insolation and are open during eclipse, and that the Battery ORU heater switches are closed when the Battery cells are below 1° C and open when warmer. These are automated functions.
2. For step 4.1, the Battery Cell temperatures should begin increasing shortly after the Battery Cell Heater and Battery Heater Power switches are closed.
3. For step 4, it is advisable that detailed displays for all four Battery ORUs be active, as well as the higher level BCDU/Battery graphical displays.
4. Step 4.3 is listed after 4.1 and 4.2, but can be completed in any sequence after step 3 is complete and before the Battery Cells have reached the temperature and pressure goals shown in steps 4.1 and 4.2. The recommended process is to perform step 4.3 near the middle of an Eclipse or Insolation period when attention would not otherwise be required for the Battery Heater Switch transitions.

1. Monitor Battery Temperatures Until Cells Reach a Minimum of 0° C

✓Batt 4B(2B)11 Cell 02 Temp > -2 --- 4° C

✓Batt 4B(2B)11 Cell 08 Temp > -2 --- 4° C

✓Batt 4B(2B)11 Cell 20 Temp > -2 --- 4° C

✓Batt 4B(2B)11 Cell 28 Temp > -2 --- 4° C

✓Batt 4B(2B)12 Cell 02 Temp > -2 --- 4° C

✓Batt 4B(2B)12 Cell 08 Temp > -2 --- 4° C

✓Batt 4B(2B)12 Cell 20 Temp > -2 --- 4° C

✓Batt 4B(2B)12 Cell 28 Temp > -2 --- 4° C

✓Batt 4B(2B)21 Cell 02 Temp > -2 --- 4° C

✓Batt 4B(2B)21 Cell 08 Temp > -2 --- 4° C

✓Batt 4B(2B)21 Cell 20 Temp > -2 --- 4° C

✓Batt 4B(2B)21 Cell 28 Temp > -2 --- 4° C

✓Batt 4B(2B)22 Cell 02 Temp > -2 --- 4° C

✓Batt 4B(2B)22 Cell 08 Temp > -2 --- 4° C

✓Batt 4B(2B)22 Cell 20 Temp > -2 --- 4° C

✓Batt 4B(2B)22 Cell 28 Temp > -2 --- 4° C

2. Ensure Battery Cell Pressures Are Within Acceptable Range

✓Batt 4B(2B)11 Cell A Press < 1.03×10^4 kPa
✓Batt 4B(2B)11 Cell B Press < 1.03×10^4 kPa
✓Batt 4B(2B)11 Cell C Press < 1.03×10^4 kPa
✓Batt 4B(2B)11 Cell D Press < 1.03×10^4 kPa

✓Batt 4B(2B)12 Cell A Press < 1.03×10^4 kPa
✓Batt 4B(2B)12 Cell B Press < 1.03×10^4 kPa
✓Batt 4B(2B)12 Cell C Press < 1.03×10^4 kPa
✓Batt 4B(2B)12 Cell D Press < 1.03×10^4 kPa

✓Batt 4B(2B)21 Cell A Press < 1.03×10^4 kPa
✓Batt 4B(2B)21 Cell B Press < 1.03×10^4 kPa
✓Batt 4B(2B)21 Cell C Press < 1.03×10^4 kPa
✓Batt 4B(2B)21 Cell D Press < 1.03×10^4 kPa

✓Batt 4B(2B)22 Cell A Press < 1.03×10^4 kPa
✓Batt 4B(2B)22 Cell B Press < 1.03×10^4 kPa
✓Batt 4B(2B)22 Cell C Press < 1.03×10^4 kPa
✓Batt 4B(2B)22 Cell D Press < 1.03×10^4 kPa

3. Enable DC Control Power to Channel 2B(4B) EPS

P6: EPS: Energy Storage 4B(2B)

Close BCDU 4B(2B)1 CP RBI

'BCDU 4B(2B)1'

sel CP RBI

cmd CP RBI Close Arm

cmd CP RBI Close

✓CP RBI Position - Closed

✓CP RBI Voltage < 3.0 V

✓CP RBI Current < 1.0 A

Close BCDU 4B(2B)2 CP RBI

'BCDU 4B(2B)2'

sel CP RBI

cmd CP RBI Close Arm

cmd CP RBI Close

✓CP RBI Position - Closed

✓CP RBI Voltage < 3.0 V

✓CP RBI Current < 1.0 A

CH 4B(2B) BATTERY CHARGING

- PCS
1. ENABLE BATTERY DISCHARGE CONTROL ALGORITHM
P6: EPS: ENERGY STORAGE 2B(4B)
[ENERGY STORAGE 2B(4B)]
'BCDU 2B(4B)1,2'

sel Software
cmd Disch Cntl Inh Off - Arm
cmd Disch Cntl Inh - Off
√Disch Cntl Inh Stat - Off

2. VERIFY FI CLOSED AND CONVERTER ON

[ENERGY STORAGE 2B(4B)]
'BCDU 2B(4B)1,2'

If in Eclipse

Verify FI - Op
Verify Converter - Off

* If FI - Cl *
* sel FI *
* √FI Op Inh - Off *
* **cmd** FI Op - Arm *
* **cmd** FI - Op *
* *
* If Converter - On *
* sel Converter *
* √Cnvr Pwr On Inh - Off *
* **cmd** Cnvr Pwr Off - Arm *
* **cmd** Cnvr Pwr - Off *
* *
* Perform TBD Malfunction procedure. *

Wait for transition to insolation.

If in Insolation

Verify FI - Cl
Verify Converter - On

```
*****
* If FI - Op
*   sel FI
*   √FI Cl Inh - Off
*   cmd FI Cl - Arm
*   cmd FI - Cl
*
* If Converter - Off
*   sel Converter
*   √Cnvtr Pwr On Inh - Off
*   cmd Cnvtr Pwr On - Arm
*   cmd Cnvtr Pwr - On
*
* Perform TBD Malfunction procedure.
*****
```

√Converter - On
 √FI - Cl
 √FI Input Voltage ≥ 78.0 V
 √FI Input Current ≥ 2.0 A
 √Battery Voltage ≥ 78.0 V
 √Battery Current ≥ 2.0 A

3. MONITOR FOR COMPLETION OF BATTERY CHARGING

NOTE

Battery charging may require four orbits. Charging is considered complete when SOC has reached or exceeded 100%.

PARAMETER	INSOLATION	ECLIPSE
'BCDU 2B(4B)1,2'		
SOC%	0% --- 100%	0% --- 100%
Converter	On	Off
FI	Cl	Op
Primary Current	2.0 --- 30.0 A	~0.0 A
FI Input Voltage	78.0 --- 130.0 V	~0.0 V
FI Input Current	2.0 --- 30.0 A	~0.0 A
Battery Voltage	78.0 --- 130.0 V	78.0 --- 130.0 V
Battery Current	2.0 --- 30.0 A	~0.0 A
'BATT 2B(4B)11,12'		
Avg Temp	0 --- 10° C	0 --- 10° C
Avg Press	5 --- 6890 kPa	5 --- 6890 kPa
Vbus	38.0 --- 60.0 V	38.0 --- 60.0 V

CH 4B(2B) CONFIGURE FOR NOMINAL OPERATIONS

CAUTION

Steps 1 and 2 must both be performed sequentially during an insolation period to prevent a possible APCU overcurrent trip in eclipse once the discharge control and heater power control FIs are activated.

- PCS
1. RECONFIGURE BCDU AND BATTERY CONTROL FUNCTIONAL INHIBITS
 1. Disable BCDU Discharge Control and Heater Power Control

P6: EPS: ENERGY STORAGE 4B(2B)
ENERGY STORAGE 4B(2B)
'BCDU 2B(4B)1,2'

sel Software TBD (Primary PVCU MDM)
cmd BCDU 4B(2B)1,2 Disch Cntl Inh - On Arm
cmd BCDU 4B(2B)1,2 Disch Cntl Inh - On
√BCDU 4B(2B)1,2 Disch Cntl Inh Stat - On

cmd BCDU 4B(2B)1,2 Heater Power Cntl Inh - On Arm
cmd BCDU 4B(2B)1,2 Heater Power Cntl Inh - On
√BCDU 4B(2B)1,2 Heater Power Cntl Inh Stat - On

sel Software TBD (Backup PVCU MDM)
cmd BCDU 4B(2B)1,2 Disch Cntl Inh - On Arm
cmd BCDU 4B(2B)1,2 Disch Cntl Inh - On
√BCDU 4B(2B)1,2 Disch Cntl Inh Stat - On

cmd BCDU 4B(2B)1,2 Heater Power Cntl Inh - On Arm
cmd BCDU 4B(2B)1,2 Heater Power Cntl Inh - On
√BCDU 4B(2B)1,2 Heater Power Cntl Inh Stat - On

sel Converter
√BCDU 4B(2B)1,2 Converter Status - On
sel FI
√BCDU 4B(2B)1,2 FI Position - CI
sel Htr Sw A
√BCDU 4B(2B)1,2 Htr Switch A Position - Op
sel Htr Sw B
√BCDU 4B(2B)1,2 Htr Switch B Position - Op
 2. Enable Battery Reverse Polarity Protection

sel Software TBD (Primary PVCU MDM)
cmd Batt 4B1(2B1)1,2 Rev Polarity Inh - Off Arm
cmd Batt 4B1(2B1)1,2 Rev Polarity Inh - Off
√Batt 4B1(2B1)1,2 Rev Polarity Inh Stat - Off

cmd Batt 4B2(2B2)1,2 Rev Polarity Inh - Off Arm
cmd Batt 4B2(2B2)1,2 Rev Polarity Inh - Off
√Batt 4B2(2B2)1,2 Rev Polarity Inh Stat - Off

sel Software TBD (Backup PVCU MDM)
cmd Batt 4B1(2B1)1,2 Rev Polarity Inh - Off Arm
cmd Batt 4B1(2B1)1,2 Rev Polarity Inh - Off
√Batt 4B1(2B1)1,2 Rev Polarity Inh Stat - Off

cmd Batt 4B2(2B2)1,2 Rev Polarity Inh - Off Arm
cmd Batt 4B2(2B2)1,2 Rev Polarity Inh - Off
√Batt 4B2(2B2)1,2 Rev Polarity Inh Stat - Off

2. UPDATE BUS VOLTAGE SETPOINTS AND MONITOR P6 EPS SYSTEMS
1. Update SSU and BCDU Bus Voltage Setpoints via PPL
P6: EPS: TBD

sel SSU Bus Voltage Setpt PPL Ver ID - TBD
ODIN/PHALCON perform TBD Data Load Procedure to Primary
PVCU MDM
√SSU Bus Voltage Setpt PPL Ver ID - TBD

sel SSU Bus Voltage Setpt PPL Ver ID - TBD
ODIN/PHALCON perform TBD Data Load Procedure to Backup
PVCU MDM
√SSU Bus Voltage Setpt PPL Ver ID - TBD

2. Monitor BCDU/Battery, DCSU, and SSU Performance

P6: EPS: SSU 4B(2B)

SSU 4B(2B)

'Output'

√Bus Voltage Setpoint: 160 V
√Voltage: 157 --- 163 V

P6: EPS: ENERGY STORAGE 4B(2B)

ENERGY STORAGE 4B(2B)

'BCDU 2B(4B)1,2'

√SOC - Increasing
√SOC - 60 --- 100%

'Battery 4B1(2B1)1,2'

√Avg Press - Increasing
√Avg Press ≤ 6890 kPa
√Avg Temp: 0 --- 10° C

'Battery 4B2(2B2)1,2'

✓Avg Press - Increasing
✓Avg Press ≤ 6890 kPa
✓Avg Temp: 0 --- 10° C

sel TBD

✓Mode Regulation Setpoint: 151 V

P6: EPS: DCSU 4B(2B)

DCSU 4B(2B)

'Primary Pwr Bus'

✓Bus Voltage: 157 --- 163 V

Wait for transition to eclipse.

P6: EPS: SSU 4B(2B)

SSU 4B(2B)

'Output'

✓Bus Voltage Setpoint: 160 V

✓Voltage: 148 --- 154 V

P6: EPS: ENERGY STORAGE 4B(2B)

ENERGY STORAGE 4B(2B)

'BCDU 4B(2B)1,2'

✓SOC - Decreasing

✓SOC: 60 --- 100%

'Battery 4B1(2B1)1,2'

✓Avg Press - Decreasing

✓Avg Press ≤ 6890 kPa

✓Avg Temp: 0 --- 10° C

'Battery 4B2(2B2)1,2'

✓Avg Press - Decreasing

✓Avg Press ≤ 6890 kPa

✓Avg Temp: 0 --- 10° C

sel TBD

✓Mode Regulation Setpoint: 151 V

P6: EPS: DCSU 4B(2B)

DCSU 4B(2B)

'Primary Pwr Bus'

✓Bus Voltage: 48 --- 154 V

3. UPDATE BATTERY CHARGE PROFILE AND BCDU VOLTAGE SETPOINTS

P6: EPS: TBD

sel CH4B Battery Current Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Primary PVCU MDM

✓CH4B Battery Current Setpt PPL Ver ID - TBD

sel CH2B Battery Current Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Primary PVCU MDM

✓CH2B Battery Current Setpt PPL Ver ID - TBD

sel CH4B Battery Current Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Backup PVCU MDM

✓CH4B Battery Current Setpt PPL Ver ID - TBD

sel CH2B Battery Current Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Backup PVCU MDM

✓CH2B Battery Current Setpt PPL Ver ID - TBD

P6: EPS: ENERGY STORAGE 4B(2B)

ENERGY STORAGE 4B(2B)

'BCDU 4B(2B)1,2'

sel TBD

✓Bus Threshold Setpt: 147 V

4. UPDATE SSU 4B(2B) LOSS OF COMM SETPOINTS

P6: EPS: SSU 4B(2B)

SSU 4B(2B)

sel PVCE

'Vbus LOC Setpt'

Enter 1 6 0 in the three digit field

cmd Vbus LOC Setpt - Set Arm

cmd Vbus LOC Setpt - Set

✓New Vbus LOC Setpt: 160 V

5. UPDATE BCDU 4B(2B) LOSS OF COMM SETPOINTS

P6: EPS: ENERGY STORAGE 4B(2B)

ENERGY STORAGE 4B(2B)

'BCDU 4B(2B)1,2'

sel TBD

'Mode Regulation LOC Setpt'

Enter 1 5 1 in data field

cmd Mode Regulation LOC Setpt - Set Arm

cmd Mode Regulation LOC Setpt - Set

√Mode Regulation LOC Setpt: 151 V

P6: EPS: TBD

sel CH4B Battery Current LOC Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Primary PVCU MDM

√CH4B Battery Current LOC Setpt PPL Ver ID - TBD

sel CH2B Battery Current LOC Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Primary PVCU MDM

√CH2B Battery Current LOC Setpt PPL Ver ID - TBD

sel CH4B Battery Current LOC Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Backup PVCU MDM

√CH4B Battery Current LOC Setpt PPL Ver ID - TBD

sel CH2B Battery Current LOC Setpt PPL Ver ID - TBD

ODIN/PHALCON perform TBD Data Load Procedure to Backup PVCU MDM

√CH2B Battery Current LOC Setpt PPL Ver ID - TBD

6. OPEN DCSU RBI 6 TO ISOLATE BUS AND PREPARE FOR APCU

SHUTDOWN

P6: EPS: DCSU 4B(2B)

DCSU 4B(2B)

sel RBI 6

cmd Position - Open Arm

cmd Position - Open

√Position - Open

'RBI 6'

√Current < 2 A

√Voltage: 134 --- 146 V

P6: EPS

'Channel 4B(2B) Output'

√Power < 1 kW

√Current < 2 A

PCU ACTIVATION

1. CHECK FOR ACTIVE COMMUNICATIONS WITH PCU
√NCS PCU Control = Enable, Initialized

2. APPLY POWER TO PCU Z13B(Z14B)

Z1: EPS:

Z1:EPS:RPCM:3B(4B)

sel
sel RPC 15
cmd Close
√Position - CI

3. PLACE PCU IN SHUTDOWN STATE
cmd Shutdown

NOTE

1. At this point, ground controllers should see telemetry indicating successful powerup.
2. Xenon preheating may require 10 to 200 hours before reaching nominal operating temperature and TBD will prevent the PCU start up sequence from proceeding until nominal operating temperature is reached.

4. COMMAND PCU TO STANDBY AND AUTONOMOUS OPERATING MODES

CAUTION

1. Both PCUs cannot be operating at the same time. One PCU should be placed in the autonomous operating mode and the other PCU either in Standby Mode or powered off.
2. If both PCUs are left operating, a differential potential may build up on the structural members of the station and cause electrical arcing and slow degradation of exposed surfaces.
3. This procedure is written to provide a safe configuration by placing one PCU in nominal operations and the second PCU in the Standby Mode.

Z1 EPS PCU 3B(4B)

sel
cmd PCU Z13B(Z14B) Standby Routine
√For a Standby Routine Complete message on PCU Display
√For PCU Mode/State = Standby

5. CONFIGURE THE PCU FOR NOMINAL OPERATIONS (DISCHARGE STATE)

cmd PCUZ13B(4B) Contactor On

✓PCU Z13B(Z14B) Temp Xe Tank: 23 --- 52° C, (74 --- 126° F)

✓PCU Z13B(Z14B) Press Xe Tank: 30 --- 3000 psi

✓PCU Z13B(Z14B) Anode Vout: 0 --- 70 Vdc

✓PCU_Z1(3,4)B_B_SPG_I_Intgrd: 0 --- 10 amperes

NOTE

The first PCU to start operations (come on-line) should be put in the Standby Operating Mode. Wait for the other PCU to come on-line and place it in the Standby Mode also unless the P6 Solar Arrays deployment is imminent. If one or more P6 Solar Arrays are deployed, one of the PCUs must be operating in the Autonomous Mode during insolar periods of the orbit.

6. COMMAND PCU Z13B(Z14B) FROM THE DISCHARGE MODE TO THE STANDBY MODE

cmd PCU Z13B(Z14B) Contactor OFF

✓For the PCU to be in the Standby State on the PCU Display

7. REPEAT STEPS 1 --- 5 FOR SECOND PCU

NOTE

Leaves second PCU in Normal Operating Mode (Discharge State) with first PCU activated in the Standby Mode allowing the heater controller to maintain Xenon temperature within normal operating range.

PCU XENON TANK THERMAL CONDITIONING

1. CHECK FOR ACTIVE COMMUNICATIONS WITH PCU
√NCS PCU Control = Enable, Initialized

2. APPLY POWER TO PCU Z13B(Z14B)

Z1: EPS:

Z1:EPS:RPCM:Z1-3B(4B)

sel
sel RPC 15
cmd Close
√Position - CI

3. PLACE PCU IN SHUTDOWN STATE

cmd Shutdown

NOTE

1. At this point, ground controllers should see telemetry indicating successful power-up.
2. Xenon preheating may require 10 to 200 hours before reaching nominal operating temperature and TBD will prevent the PCU start up sequence from proceeding until nominal operating temperature is reached.

4. COMMAND PCU TO STANDBY MODE

Z1 EPS PCU 3B(4B)

sel
cmd PCU Z13B(Z14B) Standby Routine

√Standby Routine Complete message on PCU Display

√PCU Mode/State = Standby

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RECONFIGURE NODE/Z1 EPS

Z1 PATCH PANEL RECONFIGURATION POWERDOWN	3-3
P6 POWER TRANSFER TO RUSSIAN SEGMENT.....	Refer to EPS/E1/PRE
Z1 DDCU ACTIVATION FROM P6.....	3-15
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FGB ARCU ACTIVATION.....	Refer to EPS/E1/PRE
FGB ARCU DEACTIVATION.....	Refer to EPS/E1/PRE
SM ARCU ACTIVATION.....	Refer to EPS/E1/PRE
SM ARCU DEACTIVATION.....	Refer to EPS/E1/PRE

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Z1 PATCH PANEL RECONFIGURATION POWERDOWN

PCS 1. VERIFY P6 POWER GENERATION STATUS

P6: EPS

P6:EPS

'ENERGY STORAGE 4B'

✓Batt SOC 1 > 80%

✓Batt SOC 2 > 80%

✓Batt SOC 3 > 80%

'Energy Storage 2B'

✓Batt SOC 1 > 80%

✓Batt SOC 2 > 80%

✓Batt SOC 3 > 80%

'DCSU 4B'

✓Bus Voltage: 143 --- 165 V

'DCSU 2B'

✓Bus Voltage: 143 --- 165 V

'P6: EPS: Bottom Left Corner'

✓DDCU 4B Output Pwr + Channel 4B Output Power < TBD

'P6: EPS: Bottom Right Corner'

✓DDCU 2B Output Pwr + Channel 2B Output Power < TBD

'DDCU 4B'

✓Output Pwr < 3 kW

'DDCU 2B'

✓Output Pwr < 3 kW

2. VERIFY UP-STREAM INHIBIT

EPS: Z1 CONNECTOR PATCH PANEL RECONFIG

Z1 CONNECTOR PATCH PANEL RECONFIG

'RPCM 2B-B'

✓RPC1 Position - Op

'RPCM 4B-B'

√RPC1 Position - Op

NOTE

This procedure assumes that MDM N1-2 is Primary and MDM N1-1 is Secondary.

3. INHIBIT NCS AUTORETRY
'Primary NCS'

cmd Auto Retry - Inhibit

√Auto Retry - Inh

4. COMMAND N1-1 TO DIAGNOSTICS

NOTE

Expect PCS FDA message 'CDH MDM N1-2 Detected RT Fail MDM N1-1 - PMA1'.

'N1-1 MDM'

cmd Auth Xtion Diagnostic State - Ena

cmd Diagnostic State - Transition

'Secondary NCS'

√Frame Count: 'Not Incrementing'

5. REMOVE POWER FROM SDO CARD AND N1-1 MDM
'N1-1 MDM'

cmd RPCM N1RS1 A RPC 05 - Open

√Position - Op

cmd RPCM N1RS1 A RPC 11 - Open

√Position - Op

6. DISABLE RT DEVICES I/O ON EPS BUSES
'UB EPS_N1-14'

cmd PCU_2 - Inh

cmd N1RS1_A - Inh

cmd N1RS1_B - Inh

cmd N1RS1_C - Inh

cmd Z14B_A - Inh

cmd Z14B_B - Inh

√RT Inhibit 28, 20, 19, 18, 12, 11 (six) - Inh

7. COMMAND FGB RACU 6 OFF

NOTE

Station crew must perform this step.
If not crew performed, √MCC-H.

'FGB EPS'

cmd RACU 6 - Off

√RACU 6 Power - Off

√RACU 6 Input Current < 2.0 A

√RACU 6 Output Voltage ~0.0 V

Notify EV, Go For Patch Panel 4B

Cable W05-P1 →|← J3

On EV GO

8. SUPPLY POWER TO Z1 LOADS

'Z14B SPDA Power Control'

cmd RPCM 4B-B RPC 1 - Close

√Position - Cl

9. VERIFY FGB POWER GENERATION STATUS

'FGB EPS'

√Main Bus Voltage 1,2 (two): 28.0 --- 29.0

√Battery Voltage 1 --- 6 (six, along bottom) > 25.5

* If any Battery Voltage < 25.5 V *

* Notify MCC: FGB Batteries low. *

* Wait 1 rev for FGB battery charge. *

10. COMMAND RACU 6 ON

On MCC GO

NOTE

Station crew must perform this step.
If not crew performed, √MCC-H.

'FGB EPS'

cmd RACU 6 - On

√Converter - On

√Input Current > 2.0

√Output Current > 0.3

√Output Voltage: 121 --- 125

Crew inform **MCC-H**: "RACU 6 Power On at ____/____:____ GMT."

```
*****
* If Output Current > 10 Amps      *
*   sel Commands                  *
*     cmd RACU 6 - Off Execute   *
*   *                                *
*     √MCC-H                         *
*****
```

11. VERIFY N1-1 TRANSITION TO STANDBY

NOTE

MDM may take up to 5 minutes to warm-up
and go through POST.

'Secondary NCS'

√Major State - Standby

12. COMMAND N1-1 MDM TO SECONDARY
'N1-1 MDM'

cmd Secondary State - Transition

'Secondary NCS'

√Major State - Secondary

13. ENABLE RT DEVICES I/O ON RACU 6 EPS BUSES

```
*****
* If N1-2 powerdown will be delayed  *
*   'Primary NCS'                      *
*   *                                *
*     cmd Auto Retry - Ena            *
*     √Auto Retry - Ena              *
*****
```

'UB EPS N1 14'

cmd N1RS1_A - Ena
cmd N1RS1_B - Ena
cmd N1RS1_C - Ena

√RT Inhibited 20, 19, 18 (three) - <blank>

14. PROVIDE POWER TO MDM SDO CARD
'N1-1 MDM'

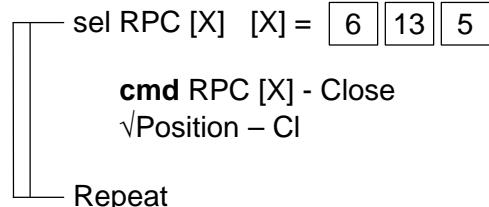
cmd RPC 5 - Close
√Position - Cl

15. REACTIVATE EARLY COMM HEATERS

NOTE

The Early Comm equipment is powered by
the Stbd CBM RPCs.

'ECOMM Heaters'



16. INHIBIT NCS AUTORETRY

'Secondary NCS'

cmd Auto Retry - Inh

√Auto Retry - Inh

17. COMMAND N1-2 TO DIAGNOSTICS

NOTE

1. Expect 'Disconnect' message on PCS.
2. Possible PDI DECOM Fail message.

'N1-2 MDM'

cmd Auth Xtion Diagnostic State - Ena

cmd Diagnostic State - Trasnition

Wait 20 seconds for transition.

NOTE

Perform step 18 if no comm with **MCC-H**.
If not crew performed, INCO will perform step 18.

18. TELEMETRY RECOVERY ON OIU

CRT

SM 212 OIU

BUS 4 BC - ITEM 15 EXEC (*)

BUS 3 RT - ITEM 10 EXEC (*)

Change OIU N1 Phys Dev to N1-1 - ITEM 18 +4 EXEC

Wait 1 minute from diagnostic command.

CRT

Reload OIU Format 2 - ITEM 1 +2 EXEC

PCS 19. TELEMETRY RECOVERY ON PCS
On PCS attached to UOP (PDIP) N1-1 port

sel icon to open PCS CDS Main Control Panel Window
√status box - yellow
sel 'Connect to MDM'
√status box - green
Verify 'connected to MDM' indicated.

Home page will display when load complete (~1 minute).

NOTE

Expect PCS FDA 'CDH MDM N1-1 detected RT fail MDM N1-2 - PMA1'.

Node 1: C&DH: MDM N1-1

Primary NCS MDM Node1

'MDM Major State'

√State - Primary

* If State not Primary or no N1-1 TLM *

* √MCC *

20. REMOVE POWER FROM N1-2 MDM AT RPC
EPS: Z1 CONNECTOR PATCH PANEL RECONFIG
Z1 CONNECTOR PATCH PANEL RECONFIG

NOTE

Expect PCS FDA (LED and message only) when MDM power removed.

'N1-2 MDM'

sel RPC 03
cmd RPCM N1RS2 C RPC 3 - Open
√Position - Op

cmd RPCM N1RS2 C RPC 13 - Open
√Position - Op

21. DISABLE RT DEVICES I/O ON EPS BUSES
'UB EPS_N1 23'

cmd PCU_1 - Inh
cmd N1RS2_A - Inh
cmd N1RS2_B - Inh
cmd N1RS2_C - Inh
cmd Z13B_A - Inh
cmd Z13B_B - Inh

✓RT Inhibit 28, 20, 19, 18, 12, 11 (five) - Inh

22. COMMAND FGB RACU 5 OFF

NOTE

Station crew must perform this step.
If not crew performed, ✓**MCC-H**.

'FGB EPS'

cmd RACU 5 - Off
✓RACU 5 Converter - Off
✓RACU 5 Input Current < 2.0 A
✓RACU 5 Output Voltage ~0.0 V

Notify EV, Go for Patch Panel 3B
Cable W10-P1 →|← J3

ON EV GO

23. SUPPLY POWER TO Z1 LOADS
'Z13B SPDA Power Control'

cmd RPCM 4B-B RPC1 - Close
✓Position - CI

24. VERIFY FGB POWER GENERATION STATUS
'FGB EPS'

✓Main Bus Voltage 1,2 (two): 28.0 --- 29.0
✓Battery Voltage 1 --- 6 (six along bottom) > 25.5

* If any Battery Voltage < 25.5 V *
* Notify **MCC-H**: FGB Batteries low. *
* Wait 1 rev for FGB battery charge. *

25. COMMAND RACU 5 ON
On MCC GO

NOTE

Station crew must perform this step.
If not crew performed, √MCC-H.

'FGB EPS'

cmd RACU 5 - On
√RACU 5 Converter On
√Input Current > 2.0
√Output Current > 0.3
√Output Voltage: 121 --- 125

Crew inform **MCC-H**: "RACU 5 Power On at ___/___:___ GMT."

```
*****
* If Output Current > 10 Amps      *
*   sel Commands                  *
*   cmd RACU 5 - Off Execute *
*                                     *
*   √MCC-H                         *
*****
```

26. VERIFY N1-2 IN STANDBY

NOTE

MDM may take up to 5 minutes to warmup
and go through POST.

'Secondary NCS'

√Major State - Standby

```
*****
* If State not Standby,      *
*   √MCC-H                   *
*****
```

27. COMMAND N1-1 TO STANDBY

NOTE

Expect PDI DECOM Fail message. After commanding
N1-1 to Standby it could take as long as 3 minutes for
N1-2 to become Primary.

Node 1: C&DH: MDM N1-1

Primary NCS MDM Node1

'MDM Major State'

sel Commands

00:05:00 **cmd Prim_NCS_Xsitn_Stby_State Execute**

28. TELEMETRY RECOVERY ON PCS AND OIU

CRT

SM 212 OIU

BUS 3 BC - ITEM 11 EXEC (*)

BUS 4 RT - ITEM 14 EXEC (*)

Change OIU N1 Phys Dev to N1-2 - ITEM 18 +3 EXEC

Wait 1 minute from command to standby.

NOTE

Expect PDI DECOM Fail message..

Reload OIU FORMAT - ITEM 1 +2 EXEC

29. TELEMETRY RECOVERY ON PCS

PCS

On PCS attached to PDIP N1-2 port

sel icon to open PCS CDS Main Control Panel Window

√status box - yellow

sel 'Connect to MDM'

√status box - green

Verify 'connected to MDM' indicated.

PCS

Node 1: C&DH: MDM N1-2

Primary NCS MDM Node1

'MDM Major State'

√State - Primary

30. COMMAND N1-1 MDM TO SECONDARY

'N1-1 MDM'

cmd Secondary State - Transition

'Secondary NCS'

√Major State - Secondary

31. VERIFY RT DEVICES I/O ON EPS BUSES

'UB EPS_N1-23'

√RT Inhibited 18, 19, 20 (three) - <blank>

32. ENABLE N1-1 MDM NCS AUTO RETRY

'Secondary NCS'

cmd Auto Retry - Ena

√Auto Retry - Ena

33. PROVIDE POWER TO MDM N1-2 SDO CARD
'N1-2 MDM'

cmd RPCM N1RS2 C RPC 3 - Close
√Position - Cl

NOTE

Perform following steps if no comm with **MCC-H**.
If not crew performed, **MCC-H** can complete the procedure.

34. VERIFY RPCM POWER BUS CONNECTIVITY

Node 1: EPS NODE1: EPS

√N1RS1 A, B, C (three) - Active (blue buttons)
√N1RS2 A, B, C (three) - Active (blue buttons)

Node 1: EPS NODE1: EPS

√Z13B A, B (two) - Active (blue buttons)
√Z14B A, B (two) - Active (blue buttons)

* If any RPCM not active, √**MCC-H**. *

35. ENABLE NODE 1 A HEATERS TO BACK-UP

Node 1: TCS

Node1:TCS

'NODE 1'

sel Nod1 Htr[X]A [X] =

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

sel Htr Commands (right side)
cmd Htr[X]A Ena Bkup **Execute**
√Nod1 Htr[X]A Availbty - Ena Bkup
Repeat

36. INHIBIT PMA1 B HEATERS

Node 1: TCS

Node1:TCS

'PMA1'

sel PMA1 Htr[X]B [X] = 1 2 3 5

sel Htr Commands (right side)
cmd Htr[X]B Ena Bkup **Execute**
√Nod1 Htr[X]B Availbty - Ena Bkup

Repeat

NOTE

The PMA1 and Node 1 Heater set points
will be commanded by **MCC-H**.

37. ACTIVATE Z1 HEATERS

Z1: EPS: RPCM Z13B-B

RPCM Z13B-B

sel RPC [X] X = 6 7 10 11 12 16

sel Commands
cmd Close **Execute**
√Position - CI

Repeat

Z1: EPS: RPCM Z14B-B

RPCM N1ZB-B

sel RPC [X] X = 2 3 4 5 6 7 10 11 12 14 16

sel Commands
cmd Close **Execute**
√Position - CI

Repeat

Z1: EPS

Z1-3B Rail Heaters

sel Z1 [X] X = 3B 4B

cmd Z1[X] Htr A Ena Opr
√Status - Inh

Repeat

Z1: EPS
Z1-4B Rail Heaters

sel Z1 [X] X = 3B 4B
cmd Z1[X] Htr B Ena Bu
✓Status - Inh
Repeat

Z1 DDCU ACTIVATION FROM P6

- PCS 1. VERIFY SOURCE POWER AND CLOSE RBI 6
P6: EPS: DCSU 4B(2B)
DCSU 4B(2B)

✓Vbus: 146 --- 165 V
sel RBI 6
cmd Close Arm
cmd Close
✓RBI 6 Position - Cl
✓RBI 6 Voltage: 146 --- 165 V
✓RBI 6 Current < 8 Amps

2. ENABLE DDCU Z14B(3B) REMOTE TERMINAL

sel DDCU Z14B(3B)
sel Firmware
cmd RT - Enable
✓RT Enable - X
cmd Cmd Clear
✓Integ Counter - Incrementing

3. VERIFY DDCU Z14B(3B) INPUT AND OUTPUT POWER

✓Vin: 144 --- 166 V
✓lin < 4 Amps
✓Vout < 5 V
✓Iout < 4 Amps

4. TURN DDCU Z14B(3B) CONVERTER ON

sel Converter
cmd Conv On Arm
cmd Conv On
✓Vout > 121 --- 128 V
✓Iout ~4 Amps
✓Converter Temp < 87° C
✓Pwr Supply Temp < 87° C
✓Baseplate Temp < 87° C

* *****
* If DDCU output voltage, current or temperatures go out of range, *
* Perform DDCU MALFUNCTION, all (SODF: EPS), then: *

5. VERIFY RPCMS OPERATION

sel RPCM [X] [X] = A B C

sel Firmware
cmd RT - Enable
√RT Enable - X
cmd Cmd Clear
√Integ Counter - Incrementing
√RPCs (1 --- 18) Open
√Input Current < 4 Amps
√Input Voltage: 121 --- 128V
√Baseplate Temp < 49° C

Repeat

NODE 1 PATCH PANEL RECONFIGURATION

- PCS 1. VERIFY P6 POWER GENERATION STATUS
- P6: EPS
P6:EPS
'ENERGY STORAGE 4B'
- √Batt SOC 1 > 80%
√Batt SOC 2 > 80%
√Batt SOC 3 > 80%
- 'Energy Storage 2B'
- √Batt SOC 1 > 80%
√Batt SOC 2 > 80%
√Batt SOC 3 > 80%
- 'DCSU 4B'
- √Bus Voltage: 143 --- 165 V
- 'DCSU 2B'
- √Bus Voltage: 143 --- 165 V
- 'P6:EPS:Bottom Left Corner'
- √DDCU 4B Output Pwr + Channel 4B Output Power < 3 kW
- 'P6:EPS:Bottom Right Corner'
- √DDCU 2B Output Pwr + Channel 2B Output Power < 3 kW
- 'DDCU Z14B'
- √Output Pwr < 3 kW
- 'DDCU Z13B'
- √Output Pwr < 3 kW

NOTE
This procedure assumes that MDM N1-2
is Primary and MDM N1-1 is Secondary.

- Node 1 2. ACTIVATE ALL NODE 1 LIGHTS
- Fwd Node 1 General Lighting Pb - On
√All Node 1 Interior Lights (eight) - Full Bright Endcone

CAUTION

Crew can only work two hours in the Node without the IMV and the Cabin Fan operating.

PCS 3. DEACTIVATE NODE 1 - FGB VENTILATION

Node 1: ECLSS: Aft Port IMV Fan

Node 1 Aft Port IMV Fan

'Node 1 Aft Port IMV Fan'

cmd Off Execute

√Status - Off

√Speed, rpm is decreasing

FGB: ECLSS

FGB ECLSS

FGB Dock Adapter PEV - CI

Node 1 PEV - CI

4. CONFIGURE AFT PORT IMV VALVE CLOSED

Node 1: ECLSS: Aft Stbd IMV Vlv

Nod1 Aft Port IMV Vlv

'RPCM N14B C RPC 05'

√Close Cmd - Ena

sel RPC Commands

cmd Close Execute

√Position - CI

'Nod1 Aft Port IMV Vlv'

√Stat - Off

√Ena Stat - Off

sel Vlv Commands

cmd On Execute

√Op - Not Op

√CI - CI

√Stat - CI

√Ena Stat - On

sel Vlv Commands

cmd Close Execute

√Stat - In

Trans wait 20 seconds, then

√Stat - CI

5. DEACTIVATE NODE 1 CABIN FAN

Node 1: ECLSS: Cab Fan

Nod1 Cab Fan

'Nod1 Cab Fan'

sel Fan Commands

cmd Off Execute

√Stat - Off

√Lim Stat - Inh

√Spd - Decreasing

'RPCM N14B B RPC 17'

sel RPC Commands

cmd Open Execute

√Position - Op

6. DEACTIVATE SMOKE DETECTOR 1

Node 1: ECLSS: SD1

Nod1 SD 1

'Nod1 SD 1'

sel SD Commands

cmd Mon Inh Execute

√Mon Stat - Not Mon

'RPCM N14B C RPC 03'

sel RPC Commands

cmd Open Execute

√Position - Op

7. INHIBIT NCS AUTORETRY

EPS: Z1 CONNECTOR PATCH PANEL RECONFIG

Z1 CONNECTOR PATCH PANEL RECONFIG

'Primary NCS'

cmd Auto Retry - Inhibit

√Auto Retry - Inh

8. COMMAND N1-1 TO DIAGNOSTICS

NOTE

Expect PCS FDA message 'CDH MDM N1-2
Detected RT Fail MDM N1-1 - PMA1'.

'N1-1 MDM'

cmd Auth Xtion Diagnostic State - Ena
cmd Diagnostic State - Transition

'Secondary NCS'

✓Frame Count: 'Not Incrementing'

9. REMOVE POWER FROM SDO CARD AND N1-1 MDM
'N1-1 MDM'

cmd RPCM N1RS1 A RPC 05 - Open

✓Position - Op

cmd RPCM N1RS1 A RPC 11 - Open

✓Position - Op

10. DISABLE RT DEVICES I/O ON EPS BUSES
'UB EPS_N1-14'

cmd RPCM_N1RS1_A_Inh

cmd RPCM_N1RS1_B_Inh

cmd RPCM_N1RS1_C_Inh

✓RT Inhibit 20, 19, 18 (three) - Inh

'LB SYS LAB 1'

cmd RPCM_N14B_A_Inh

cmd RPCM_N14B_B_Inh

cmd RPCM_N14B_C_Inh

✓RT Inhibit 20, 19, 18 (three) - Inh

11. COMMAND FGB RACU 6 OFF
'FGB EPS'

cmd RACU 6 - Off

✓RACU 6 Power - Off

✓RACU 6 Input Current < 2.0 A

✓RACU 6 Output Voltage ~0.0 V

12. COMMAND DDCU Z1-4B CONVERTER OFF
'4B Power Control'

cmd DDCU Z14B Converter - Off Arm

cmd DDCU Z14B Converter - Off

✓Current < 0.5 A

✓Voltage ~0.0 V

Notify EV, Go for Patch Panel A1 Reconfig

On Crew GO

13. COMMAND DDCU Z1-4B CONVERTER ON
‘4B Power Control’

cmd DDCU Z14B Converter - Off Arm
cmd DDCU Z14B Converter - Off
√Current < 0.5 A
√Voltage ~123.0 V

14. VERIFY N1-1 TRANSITION TO STANDBY

<p style="text-align: center;"><u>NOTE</u></p> <p>MDM may take up to 5 minutes to warmup and go through POST.</p>

‘Secondary NCS’

√Major State - Standby

15. COMMAND N1-1 MDM TO SECONDARY
‘N1-1 MDM’

cmd Secondary State - Transition

‘Secondary NCS’

√Major State - Secondary

16. ENABLE RT DEVICES I/O ON RACU 6 EPS BUSES

* *****
* If N1-2 power down will be delayed *
* *
* ‘Primary NCS’ *
* *
* **cmd** Auto Retry - Ena *
* √Auto Retry - Ena *

‘UB EPS N1 14’

cmd RPCM_N1RS1_A - Ena
cmd RPCM_N1RS1_B - Ena
cmd RPCM_N1RS1_C - Ena

√RT Inhibited 20, 19, 18 (three) - <blank>

'LB SYS LAB 1'

cmd RPCM_N14B_A - Ena
cmd RPCM_N14B_B - Ena
cmd RPCM_N14B_C - Ena

√RT Inhibited 20, 19, 18 (three) - <blank>

17. PROVIDE POWER TO MDM SDO CARD
'N1-1 MDM'

cmd RPC 5 - Close
√Position - Cl

18. NODE 1 AFT PORT IMV VLV OPENING
Node 1: ECLSS: FDIR
Node 1 FDIR Details

√N1_1 MDM IMV FDIR Stat - Ena
√N1_2 MDM IMV FDIR Stat - Ena

Node 1: ECLSS: AFT PORT IMV VLV
Node 1 Fwd Stbd IMV
'RPCM N14B C RPC 05'

sel RPC Commands
cmd Close **Execute**
√Position - Cl

'Node 1 Aft Port IMV Vlv'

sel Vlv Commands
cmd On **Execute**
cmd Open **Execute**
√Stat - In Transition
Wait 20 seconds.
√Stat - Op

19. CONFIGURE IMV AFT PORT FAN ON
Node 1: ECLSS
NODE 1: ECLSS

sel Node_1_Aft_Port_IMV_Fan
sel RPC Commands

cmd RPC Position - Close **Execute**
√RPC Position - Close

NODE 1: Aft Port IMV Fan

cmd On Execute
√Status - In Transition

Wait 15 seconds.

√Status - On
√Speed, rpm: 7462 --- 9500

20. ACTIVATE NODE 1 CABIN FAN

Node 1: ECLSS: Cab Fan

Nod1 Cab Fan

'RPCM N14B B RPC 17'

sel RPC Commands
cmd Close Execute
√Position - Cl

'Nod1 Cab Fan'
sel Fan Commands
cmd On Execute
√Stat - On
√Lim Stat - Ena

21. SMOKE DETECTOR SD 1 ACTIVATION

Node 1: ECLSS: SD1

Nod1 SD 1

'RPCM N14B C RPC 03'

sel RPC Commands
cmd Close Execute
√Position - Cl

'Nod1 SD 1'

sel SD Commands
cmd Mon Ena Execute
√Act Bit In Prog - True

Wait 3 seconds, then
√Act Bit In Prog - False
√Act Bit Fail - Operational
√Obscuration: 0% Contam
√Scatter: 0% obs/m
√Mon Stat - Mon

- PCS 22. SMOKE DETECTOR 2 DEACTIVATION
Node 1: ECLSS: SD2
[Nod1 SD 2]
'Nod1 SD 2'

sel SD Commands
cmd Mon Inh **Execute**
√Mon Stat - Not Mon

'RPCM N13B A RPC 16'

sel RPC Commands
cmd Open **Execute**
√Position - Op

23. REACTIVATE EARLY COMM HEATERS

NOTE
The Early Comm equipment is powered by
the Stbd CBM RPCs.

EPS: Z1 CONNECTOR PATCH PANEL RECONFIG
[Z1 CONNECTOR PATCH PANEL RECONFIG]
'ECOMM Heaters'

[sel RPC [X] [X] = [6] [13] [5]
 |
 | **cmd** RPC [X] - Close
 | √Position - Cl
 |
 | Repeat

24. INHIBIT NCS AUTORETRY
'Secondary NCS'

cmd Auto Retry - Inh
√Auto Retry - Inh

25. CONFIGURE DECK AFT IMV VALVE CLOSED
Node 1: ECLSS: Deck Aft IMV Vlv
[Nod1 Deck Aft IMV Vlv]
'RPCM N13B RPC 15'

√Close Cmd - Ena
sel RPC Commands
cmd Close **Execute**
√Position - Cl

'Nod1 Deck Aft IMV Vlv'

√Stat - Off
√Ena Stat - Off

sel Vlv Commands
cmd On Execute
√Op - Not Op
√CI - CI
√Stat - CI
√Ena Stat - On

sel Vlv Commands
cmd Close Execute
√Stat - In Trans
Wait 20 seconds, then
√Stat - CI

26. COMMAND N1-2 TO DIAGNOSTICS

NOTE

1. Expect 'Disconnect' message on PCS.
2. Possible PDI DECOM Fail message.

'N1-2 MDM'

cmd Auth Xtion Diagnostic State - Ena
cmd Diagnostic State - Trasnition

Wait 20 seconds for transition.

NOTE

Perform step 18 if no comm with **MCC-H**.
If not crew performed, INCO will perform step 18.

27. TELEMETRY RECOVERY ON OIU

CRT

SM 212 OIU

BUS 4 BC - ITEM 15 EXEC (*)
BUS 3 RT - ITEM 10 EXEC (*)
Change OIU N1 Phys Dev to N1-1 - ITEM 18 +4 EXEC

CRT

Wait 1 minute from diagnostic command.
Reload OIU Format 2 - ITEM 1 +2 EXEC

- PCS 28. TELEMETRY RECOVERY ON PCS
On PCS attached to UOP (PDIP) N1-1 port

sel icon to open PCS CDS Main Control Panel Window
√status box - yellow
sel 'Connect to MDM'
√status box - green
Verify 'connected to MDM' indicated

Home page will display when load complete (~1 minute).

NOTE
Expect PCS FDA 'CDH MDM N1-1 detected RT fail MDM N1-2 - PMA1'.

Node 1: C&DH: MDM N1-1
Primary NCS MDM Node1
'MDM Major State'

√State - Primary

* If State not Primary or no N1-1 TLM *
* *
* √MCC

- PCS 29. REMOVE POWER FROM N1-2 MDM AT RPC
EPS: Z1 CONNECTOR PATCH PANEL RECONFIG
Z1 CONNECTOR PATCH PANEL RECONFIG

NOTE
Expect PCS FDA (LED and message only)
when MDM power removed.

'N1-2 MDM'

sel RPC 03
cmd RPCM N1RS2 C RPC 3 - Open
√Position - Op

cmd RPCM N1RS2 C RPC 13 - Open
√Position - Op

30. DISABLE RT DEVICES I/O ON EPS BUSES
'UB EPS_N1 23'

cmd PCU_1 - Inh
cmd N1RS2_A - Inh
cmd N1RS2_B - Inh
cmd N1RS2_C - Inh

√RT Inhibit 18, 19, 20 (three) - Inh

'LB SYS LAB 2'

cmd Inhib_RPCM_N13B_A - Inh

cmd Inhib_RPCM_N13B_B - Inh

cmd Inhib_RPCM_N13B_C - Inh

√RT Inhibit 20, 19, 18 (three) - Inh

31. COMMAND FGB RACU 5 OFF
'FGB EPS'

cmd RACU 5 - Off

√RACU 5 Converter - Off

√RACU 5 Input Current < 2.0 A

√RACU 5 Output Voltage ~0.0 V

32. COMMAND DDCU Z1-3B CONVERTER OFF
'2B Power Control'

cmd DDCU Z13B Converter - Off

√Output Voltage ~0.0 V

√Current < 0.5 A

Notify EV, Go for Patch Panel A2 Reconfig

On Crew GO

33. COMMAND DDCU Z1-3B CONVERTER ON
'2B Power Control'

cmd DDCU Z13B Converter - On

√Output Voltage ~123 V

√Current < 0.5 A

34. VERIFY N1-2 IN STANDBY

NOTE

MDM may take up to 5 minutes to warmup
and go through POST.

'Secondary NCS'

√Major State - Standby

* If State not Standby, *

* *

√**MCC-H**

35. COMMAND N1-1 TO STANDBY

NOTE

Expect PDI DECOM fail message. After commanding N1-1 to Standby it could take as long as 3 minutes for N1-2 to become Primary.

PCS Node 1: C&DH: MDM N1-1
 Primary NCS MDM Node1
 'MDM Major State'

00:05:00 sel Commands
 cmd Prim_NCS_Xsitn_Stby_State Execute

36. TELEMETRY RECOVERY ON PCS AND OIU

CRT SM 212 OIU

BUS 3 BC - ITEM 11 EXEC(*)
BUS 4 RT - ITEM 14 EXEC(*)
Change OIU N1 Phys Dev to N1-2 - ITEM 18 +3 EXEC

Wait 1 minute from command to standby.

NOTE

Expect PDI DECOM Fail message.

Reload OIU FORMAT - ITEM 1 +2 EXEC

37. TELEMETRY RECOVERY ON PCS

PCS On PCS attached to PDIP N1-2 port

sel icon to open PCS CDS Main Control Panel Window
√status box - yellow
sel 'Connect to MDM'
√status box - green
Verify 'connected to MDM' indicated

PCS Node 1: C&DH: MDM N1-2
 Primary NCS MDM Node1
 'MDM Major State'

√State - Primary

38. COMMAND N1-1 MDM TO SECONDARY
'N1-1 MDM'

cmd Secondary State - Transition

- 'Secondary NCS'
- √Major State - Secondary
39. ENABLE RT DEVICES I/O ON EPS BUSES
 'UB EPS_N1-23'
- √RT Inhibited 20, 19, 18 (three) - <blank>
- 'LB SYS LAB 2'
- √RT Inhibited 20, 19, 18 (three) - <blank>
40. NODE 1 DECK AFT IMV VLV OPENING
 Node 1: ECLSS: FDIR
Node 1 FDIR Details
- √N1_1 MDM IMV FDIR Stat - Ena
 √N1_2 MDM IMV FDIR Stat - Ena
- Node 1: ECLSS: DECK AFT IMV VLV
Node 1 Fwd Stbd IMV
 'RPCM N13B C RPC 13'
- sel RPC Commands
cmd Close Execute
 √Position - Cl
- 'Node 1 Aft Port IMV Vlv'
- sel Vlv Commands
cmd On Execute
cmd Open Execute
 √Stat - In Transition
 Wait 20 seconds.
 √Stat - Op
41. SMOKE DETECTOR SD 2 ACTIVATION
 Node 1: ECLSS: SD2
Nod1 SD 2
 'RPCM N13B A RPC 16'
- sel RPC Commands
cmd Close Execute
 √Position - Cl
- 'Nod1 SD 2'

sel SD Commands
cmd Mon Ena **Execute**
√Act Bit In Prog - True

Wait at least 3 seconds, then
√Act Bit In Prog - False
√Act Bit Fail - Operational
√Obscuration ~0% Contam
√Scatter ~0% obs/m
√Mon Stat - Mon

Node 1: ECLSS: FDIR

Nod1 FDIR Details

sel Commands
cmd N1_1_MDM Fire Isol Ena **Execute**
√Stat - Ena
cmd N1_2_MDM Fire Isol Ena **Execute**
√Stat - Ena
sel Commands
cmd N1_1_MDM IMV FDIR Ena **Execute**
√Stat - Ena
cmd N1_2_MDM IMV FDIR Ena **Execute**
√Stat - Ena

42. ENABLE N1-1 MDM NCS AUTO RETRY
'Secondary NCS'

cmd Auto Retry - Ena
√Auto Retry - Ena

43. PROVIDE POWER TO MDM N1-2 SDO CARD
'N1-2 MDM'

cmd RPCM N1RS2 C RPC 3 - Close
√Position - Cl

NOTE

Perform following steps if no comm with **MCC-H**.
If not crew performed, **MCC-H** can complete the procedure.

44. VERIFY RPCM POWER BUS CONNECTIVITY

PCS

Node 1: EPS

√N1RS1 A, B, C (three) - Active (blue buttons)
√N1RS2 A, B, C (three) - Active (blue buttons)
√N13B A, B, C (three) - Active (blue buttons)
√N14B A, B, C (three) - Active (blue buttons)

Z1: EPS

✓Z13B A, B (two) - Active (blue buttons)
✓Z14B A, B (two) - Active (blue buttons)

* If any RPCM not active, ✓**MCC-H** *

45. ENABLE NODE 1 A HEATERS TO BACK-UP

Node 1: TCS

Node 1: TCS

'NODE 1'

sel Nod1 Htr[X]A [X] =

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

sel Htr Commands (right side)
cmd Htr[X]A Ena Bkup Execute
✓Nod1 Htr[X]A Availbty - Ena Bkup
Repeat

46. COMMAND PMA1 B HEATERS TO ENABLED BACKUP

Node 1: TCS

Node1:TCS

'PMA1'

sel PMA1 Htr[X]B [X] =

1	2	3	5
---	---	---	---

sel Htr Commands (right side)
cmd Htr[X]A Ena Bkup Execute
✓Nod1 Htr[X]A Availbty - Ena Bkup
Repeat

NOTE

The PMA1 and Node 1 Heater set points will be commanded by **MCC-H**.

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S-BAND ASSEMBLY, ACT, AND C/O

S-BAND SUBSYSTEM INITIAL ACTIVATION AND TEST ON FLIGHT 4A 4-3

S-BAND ASSY,
ACT, AND C/O

S-BAND ASSY,
ACT, AND C/O

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S-BAND SUBSYSTEM INITIAL ACTIVATION AND TEST ON FLIGHT 4A

1. INHIBIT BUS FDIR ON BSP, XPDR, AND RFG

C&T: 4A S-Band Overview: Bus FDIR I/O

S_Band_Bus_FDIR_IO

'Bus FDIR(T)'

sel Inh = 0, Ena=1: 0

sel Bus ID: 11

sel RT Address: 17

cmd Bus FDIR(T)

'Bus FDIR Status'

√BSP - Inhibited

sel RT Address: 16

cmd Bus FDIR(T)

'Bus FDIR Status'

√XPDR - Inhibited

sel RT Address: 15

cmd Bus FDIR(T)

'Bus FDIR Status'

√RFG - Inhibited

2. ENABLE BSP, XPDR AND RFG FOR CYCLIC I/O

C&T: 4A S-Band Overview: Bus FDIR I/O

S_Band_Bus_FDIR_IO

'Cyclic IO(T)'

sel Inh = 0, Ena = 1: 1

sel Bus ID: 11

sel RT Address: 17

cmd Cyclic ID(T)

√BSP Cyclic IO - Enabled

sel RT Address: 16

cmd Cyclic ID(T)

√XPDR Cyclic IO - Enabled

sel RT Address: 15

cmd Cyclic ID(T)

√RFG Cyclic IO - Enabled

3. POWER ON BSP, XPDR, AND RFG

C&T: 4A S-Band Overview

4A S-Band Overview

sel RPCM Z1-3B B RPC 4

RPCM Z1-3B B RPC 4

√Close cmd - Enabled

'RPC Position'

cmd Close

√RPC Position - Closed

4A S-Band Overview

sel RPCM Z1-3B B RPC 3

RPCM Z1-3B B RPC 3

√Close cmd - Enabled

'RPC Position'

cmd Close

√RPC Position - Closed

4A S-Band Overview

sel RPCM Z1-3B B RPC 2

RPCM Z1-3B B RPC 2

√Close cmd - Enabled

'RPC Position'

cmd Close

√RPC Position - Closed

4. VERIFY BSP, XPDR, AND RFG HEALTH

C&T: 4A S-Band Overview: Baseband Signal Processor 2

4A S-Band Baseband Signal Processor 2

'BIT Summary'

√POST/ECM - Pass

√Environmental - Pass

4A S-Band Overview

sel Transponder 2

4A S-Band Transponder 2

'BIT Summary'

√POST/ECM - Pass

√Environmental - Pass

4A S-Band Overview

sel Radio Frequency Group 2

4A S-Band Radio Frequency Group 2

'BIT Summary'

√POST/ECM - Pass

√Environmental - Pass

5. **RUN BSP, XPDR AND RFG SELF TESTS**

C&T: 4A S-Band Overview: Test

S_Band_4A_ORU_Test

'ORU Self Test Selection'

cmd BSP Self Test

cmd Xpdr Self Test

cmd RFG Self Test

6. **VERIFY BSP, XPDR AND RFG SELF TEST STATUS**

C&T: 4A S-Band Overview

4A S-Band Overview

sel Baseband Signal Processor 2

4A S-Band Baseband Signal Processor 2

'BIT Summary'

√Equipment Self Test - Pass

4A S-Band Overview

sel Transponder 2

4A S-Band Transponder 2

'BIT Summary'

√Equipment Self Test - Pass

4A S-Band Overview

sel Radio Frequency Group 2

4A S-Band Radio Frequency Group 2

'BIT Summary'

√Equipment Self Test - Pass

7. RUN S-BAND XPDR BASEBAND BSP LOOPBACK SYSTEM TEST

C&T: 4A S-Band Overview: Test

S_Band_4A_ORU_Test

'System Test Selection'

cmd Xpdr BB BSP Fill CADU Lpbk

'BIT Function Configuration'

√BSP2 - System Fill CADU Loopback

√Xpdr2 - Baseband Loopback

NOTE

Allow test to run for one minute.

8. VERIFY BSP THROUGHPUT STATUS AND FWD LINK PROCESSING ERRORS

C&T: 4A S-Band Overview

4A S-Band Overview

sel Baseband Signal Processor 2

4A S-Band Baseband Signal Processor 2

'Throughput Status'

√CADUs Received: 92 --- 95

√Fill CADUs Received: 92 --- 95

√Fill CADUs Transmitted: 92 --- 95

'Forward Link Processing Errors'

√Demux Packet Length Errors - 0

√Demux R-S Decoder Failures - 0

√Demux Sequence Errors - 0

√CADU Headers Received in Error - 0

√Fill CADUs Received in Error - 0

√VCDUs Lost to Demux Overflow - 0

9. STOP S-BAND XPDR BASEBAND BSP LOOPBACK SYSTEM TEST

C&T: 4A S-Band Overview: Test

S_Band_4A_ORU_Test

cmd Stop Test

'BIT Function Configuration'

√BSP2 - Inactive

√Xpdr2 - Inactive

10. RUN S-BAND XPDR RF BSP LOOPBACK SYSTEM TEST
'System Test Selection'

cmd Xpdr RF BSP Fill CADU Lpbk

'BIT Function Configuration'

√BSP2 - System Fill CADU Loopback
√Xpdr2 - RF Loopback

NOTE

Allow test to run for one minute.

11. VERIFY BSP THROUGHPUT STATUS AND FWD LINK PROCESSING ERRORS

C&T: 4A S-Band Overview

4A S-Band Overview

sel Baseband Signal Processor 2

4A S-Band Baseband Signal Processor 2

'Throughput Status'

√CADUs Received: 92 --- 95
√Fill CADUs Received: 92 --- 95
√Fill CADUs Transmitted: 92 --- 95

'Forward Link Processing Errors'

√Demux Packet Length Errors - 0
√Demux R-S Decoder Failures - 0
√Demux Sequence Errors - 0
√CADU Headers Received in Error - 0
√Fill CADUs Received in Error - 0
√VCDUs Lost to Demux Overflow - 0

12. VERIFY XPDR TELEMETRY, ACQUISITION STATUS, AND FUNCTION STATUS

C&T: 4A S-Band Overview

4A S-Band Overview

sel Transponder 2

S-Band Transponder 2

'Telemetry'

√RF Pwr Out (dBm) > 9dbm
√Receiver AGC (V)

This telemetry should be logged.

√Digital AGC
This telemetry should be logged.
√Carrier Loop Err (Hz)
This telemetry should be logged.

'Acquisition Status'

√Carrier Lock - Lock
√Long Code - Lock
√Short Code - Lock
√PN Main Lobe - Lock
√Bit Detector - Lock

'Function Status'

√Transmitter Coherency - Noncoh
√DSP Data Rate - 192 Kbps
√DSP Mode - 2
√Transponder Configured - Yes
√Processor Reset - No

13. STOP S-BAND XPDR RF BSP LOOPBACK SYSTEM TEST

C&T: 4A S-Band Overview: Test

S_Band_ORU_Test

cmd Stop Test

'BIT Function Configuration'

√BSP - Inactive
√Xpdr - Inactive

14. ENABLE BUS FDIR ON BSP, XPDR, AND RFG

C&T: 4A S-Band Overview: Bus FDIR I/O

S_Band_Bus_FDIR_IO

'Bus FDIR(T)'

sel Inh = 0, Ena = 1: 1
sel Bus ID: 11
sel RT Address: 17
cmd Bus FDIR(T)

'Bus FDIR Status'

√BSP - Enabled

sel RT Address: 16
cmd Bus FDIR(T)

'Bus FDIR Status'

√XPDR - Enabled

sel RT Address: 15
cmd Bus FDIR(T)

'Bus FDIR Status'

√RFG - Enabled

15. VERIFY S-BAND NO-OP CONFIGURATION

C&T: 4A S-Band Overview: Configuration

4A S-Band Configuration

'Pending'

√Decryption - Off

√Key Select - 0000

√Xpdr Mode - Noncoherent

√Antenna Pointing Mode - Disabled

√Transmitter - On

√SSPA - Muted

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EEATCS ACT AND C/O

FLIGHT 4A EEATCS ACTIVATION AND CHECKOUT..... 5-3

EEATCS
ACT & C/O

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EEATCS
ACT & C/O

FLIGHT 4A EEATCS ACTIVATION AND CHECKOUT

NOTE

This procedure is performed twice sequentially: once to activate Loop A and once to activate Loop B.

PCS 1. INHIBIT AND VERIFY EEATCS SOFTWARE ALGORITHM STATES

P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands

LoopA(B) PFCS Nominal Commands

'EEATC LoopA(B) PFCS'

√FCV Cntl - Inh

sel LoopA(B) PFCS FDIR Commands

LoopA(B) PFCS FDIR Commands

'EEATC LoopA(B) PFCS'

cmd Inval Data FDIR Inh - Arm

cmd Inval Data FDIR Inh - Fire

√Inval Data FDIR - Inh

cmd FCV Temp Recal FDIR Inh - Arm

cmd FCV Temp Recal FDIR Inh - Fire

√FCV Temp Recal FDIR - Inh

NOTE

The Leak Detection FDIR operates within the Firmware. The FDIR status cannot be verified until the PFCS is activated.

cmd Min Out Temp FDIR Inh - Arm

cmd Min Out Temp FDIR Inh - Fire

√Min Out Temp FDIR - Inh

cmd Pump FDIR Inh - Arm

cmd Pump FDIR Inh - Fire

√Pump FDIR - Inh

PCS 2. INHIBIT AND VERIFY ADDITIONAL EEATCS SOFTWARE ALGORITHM STATES

P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands:

LoopA(B) PFCS FDIR Commands: LoopA(B) PFCS FDIR Additional Commands

LoopA(B) PFCS FDIR Additional Commands

'EEATC LoopA(B) PFCS'

cmd Min In Temp FDIR Inh - Arm
cmd Min In Temp FDIR Inh - Fire
√Min In Temp FDIR - Inh

√Max Out Temp FDIR - Inh

√Auto FCV Recal - Ena

sel EEATCS Overview: LoopA(B) Line Heater Commands

LoopA(B) Line Heater Commands
'EEATC LoopA(B) PFCS'

√Line Htr Cntl - Inh

√Line Htr Cmd Ck - Ena

After completing steps 1 and 2, the EEATCS FDIR and Closed Loop Control Algorithms within the software should be in the following configuration.

Parameter	Display	State
FCV Cntl	LoopA(B) PFCS Nominal Commands	Inhibited
Inval Data FDIR	LoopA(B) PFCS FDIR Commands	Inhibited
FCV Temp Recal FDIR	LoopA(B) PFCS FDIR Commands	Inhibited
Min Out Temp FDIR	LoopA(B) PFCS FDIR Commands	Inhibited
Pump FDIR	LoopA(B) PFCS FDIR Commands	Inhibited
Min In Temp FDIR	LoopA(B) PFCS FDIR Additional Commands	Inhibited
Max Out Temp FDIR	LoopA(B) PFCS FDIR Additional Commands	Inhibited
Auto FCV Recal	LoopA(B) PFCS FDIR Additional Commands	Enabled
Line Htr Cntl	LoopA(B) Line Heater Commands	Inhibited
Line Htr Cmd Ck	LoopA(B) Line Heater Commands	Enabled

- PCS 3. **POWER-ON LOOP A(B) PFCS**
P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands:
RPCM 4B(2B) A RPC 04
RPCM 4B(2B) A RPC 04

cmd RPC Position - Close
√RPC Posn - Cl

NOTE

Upon application of power to the PFCS, the FCV executes an Auto Recal algorithm which lasts approximately 93 seconds.

- PCS 4. VERIFY FCV RECALIBRATION COMPLETION
 P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands
 [LoopA(B) PFCS Nominal Commands]
 'EEATC LoopA(B) PFCS'
 Wait Until FCV Recal - Not performing
 Verify FCV Calc Setpt: 0 (Full bypass)
 Verify FCV Integ Posn: 0 ± 5.3 Degrees (Full bypass)
- PCS 5. VERIFY FIRMWARE FDIR STATUSES
 P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands:
 Loop(B) PFCS FDIR Commands
 [LoopA(B) PFCS FDIR Commands]
 'EEATC LoopA(B) PFCS'
 ✓Leak Det FDIR - Ena
 sel EEATCS Overview: LoopA(B) Firmware
 [Loop A(B) Firmware]
 'EEATC LoopA(B) PFCS'
 ✓eBIT - Inh
 sel EEATCS Overview: TTCR(STCR)
 [TTCR(STCR) Commands]
 'EEATC Loop A(B) TTCR(STCR)'
 ✓Config Fail FDIR - Ena
 ✓Auto Time Out FDIR - Ena
 ✓Auto Off - Ena
- PCS 6. ISSUE COMMON CLEAR TO PFCS
 P6: TCS: EEATCS Overview: LoopA(B) Firmware
 [LoopA(B) Firmware]
 'EEATC PFCS LoopA(B)'
 cmd Common Clear - Arm
 cmd Common Clear - Fire
- PCS 7. VERIFY PFCS SENSOR OPERATION
 P6: TCS
 [EEATCS Overview]
 'EEATC PFCS'

Verify that the following quantities read within the specified range.

Parameter	Lower Limit	Upper Limit	Other/Comments
Accum Fltrd Avg Qty	30.9%	74.1%	
Integ In Press	896 kPa	2066 kPa	
Integ Out Press	896 kPa	2066 kPa	
Integ Flow Rate	-424 kg/hr	793 kg/hr	
PumpA Conv Spd	-975 rpm	975 rpm	
PumpB Conv Spd	-975 rpm	975 rpm	
FCV Integ Posn	-5.3 Deg	5.3 Deg	Full Bypass
Byp In Temp	-78° C	50° C	
Rad Rtn Fltrd Temp	-78° C	50° C	
Out Fltrd Lwr Temp	-44° C	11° C	
Out Line Fltrd Temp	-44° C	11° C	
Integ Counter			Incrementing

'EEATC Z1 Loop A(B)'

Parameter	Lower Limit	Upper Limit
Z1 Feed Accum Integ Qty	30.9%	74.1%
Z1 Rtn Accum Integ Qty	30.9%	74.1%

sel LoopA(B) PFCS Nominal Commands: LoopA(B) PFCS FDIR
Commands: LoopA(B) PFCS FDIR Additional Commands

LoopA(B) PFCS FDIR Additional Commands

'EEATC LoopA(B) PFCS'

Verify Accum Qty1 Sel Stat - Selected
Verify Accum Qty2 Sel Stat - Selected
Verify STCR Accum Qty Sel Stat - Selected
Verify TTCR Accum Qty Sel Stat - Selected

8. ACTIVATE PUMP B AND VERIFY PARAMETERS

P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands

LoopA(B) PFCS Nominal Commands

'EEATC LoopA(B) PFCS'

CAUTION

If the Loop A(B) PFCS Integ In Press is less than 896 kPa, do not start the pump. A potential for cavitation exists below this pressure.

Verify Integ In Press \geq 896 kPa

If Integ In Press \leq 896 kPa

✓MCC

cmd PumpB - On
√PumpB Cmd Stat - On

Verify the following parameters read within the specified ranges.

Parameter	Lower Limit	Upper Limit
PumpB Conv Spd	13275 rpm	15225 rpm
Integ Pump Out DP (flow)	765 kg/hr	1176 kg/hr
Integ In Press	896 kPa	2066 kPa
Integ Out Press	896 kPa	2066 kPa
Accum Fltrd Avg Qty	30.9%	74.1%

- PCS 9. **DEACTIVATE PUMP B, ACTIVATE PUMP A, AND VERIFY PARAMETERS**
P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands
 LoopA(B) PFCS Nominal Commands
 'EEATC LoopA(B) PFCS'

cmd PumpB - Off
√PumpB Cmd Stat - Off
Verify PumpB Conv Spd: 0 ± 975 rpm

CAUTION

If the Loop A(B) PFCS Integ In Press is less than 896 kPa, do not start the pump. A potential for cavitation exists below this pressure.

Verify Integ In Press \geq 896 kPa

If Integ In Press \leq 896 kPa
 √MCC

cmd PumpA - On
√PumpA Cmd Stat - On

Verify the following parameters read within the specified ranges.

Parameter	Lower Limit	Upper Limit
PumpA Conv Spd	13275 rpm	15225 rpm
Integ Pump Out dP (flow)	765 kg/hr	1176 kg/hr
Integ In Press	896 kPa	2066 kPa
Integ Out Press	896 kPa	2066 kPa
Accum Fltrd Avg Qty	30.9%	74.1%

- PCS 10. ENABLE EEATCS CLOSED LOOP CONTROL ALGORITHMS
P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands
LoopA(B) PFCS Nominal Commands
'EEATC LoopA(B) PFCS'
- cmd** FCV Cntl Ena - Arm
cmd FCV Cntl Ena - Fire
√FCV Cntl - Ena
- sel LoopA(B) PFCS FDIR Commands
- LoopA(B) PFCS FDIR Commands**
'EEATC LoopA(B) PFCS'
- cmd** Inval Data FDIR Ena - Arm
cmd Inval Data FDIR Ena - Fire
√Inval Data FDIR - Ena
- cmd** Pump FDIR Ena - Arm
cmd Pump FDIR Ena - Fire
√Pump FDIR - Ena
- sel EEATCS Overview: LoopA(B) Line Heater Commands
- LoopA(B) Line Heater Commands**
'EEATC LoopA(B) PFCS'
- cmd** Line Htr Cntl Ena - Arm
cmd Line Htr Cntl Ena - Fire
√Line Htr Cntl - Ena
- PCS 11. CONFIGURE FDIR AND CLOSED LOOP CONTROL ALGORITHMS IN BACKUP MDM
P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands:
Bkup PVCU Command
Bkup PVCU Commands
- cmd** Bkup PVCU EEATCA(B) PFCS FCV Cntrl Ena - Arm
cmd Bkup PVCU EEATCA(B) PFCS FCV Cntrl Ena - Fire
- cmd** Bkup PVCU EEATCA(B) PFCS Line Htr Cntl Ena - Arm
cmd Bkup PVCU EEATCA(B) PFCS Line Htr Cntl Ena - Fire
- cmd** Bkup PVCU EEATCA(B) PFCS Min Out Temp FDIR Inh - Arm
cmd Bkup PVCU EEATCA(B) PFCS Min Out Temp FDIR Inh - Fire

NOTE

MCC-H will characterize the performance of the EEATCS over the next 2-3 hours. Once this is complete, a new EEATCS Setpt PPL will be loaded. This PPL contains lower setpoints which prevent the Line Heaters from cycling frequently.

Step 12 is a ground only step.

12. LOAD EEATCS SETPT PPL VERSION 2 INTO PRIMARY AND BACKUP PVCU MDM DRAM

P6: CDH

P6: CDH: TBD

'TBD'

Load EEATCS Setpt PPL Ver ID 2 into Primary PVCU MDM DRAM

Load EEATCS Setpt PPL Ver ID 2 into Backup PVCU MDM DRAM

NOTE

MCC-H will notify crew when step 12 is complete.

13. VERIFY PPL LOAD BY TELEMETRY PARAMETERS

P6: TCS: EEATCS Overview: LoopA(B) PFCS Nominal Commands

LoopA(B)_PFCS_Nominal_Commands

'EEATC LoopA PFCS'

Verify FCV Calc Setpt $\geq 80^\circ$

sel EEATCS Overview: Line Heater Icon

LoopA(B)_Line_Heater_Commands

'EEATC LoopA PFCS'

\sqrt{Ln} Htr1 RPC Posn - Op

\sqrt{Ln} Htr2 RPC Posn - Op

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MALFUNCTION PROCEDURES

(LIST TOC TBD)

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CONTINGENCIES

CONTINGENCIES

FAILURE TO ACTIVATE EPS CHANNEL	TBD
FAILURE TO ACTIVATE SECONDARY POWER	TBD
FAILURE TO CHARGE BATTERIES.....	TBD

CONTINGENCIES

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REFERENCE DATA

4A INTEGRATED DRAWINGS..... TBD

REFERENCE

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CUE CARDS

(LIST TOC TBD)

CUE CARDS

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